THE Chemical Age

VOL. LXXI 25 SEPTEMBER 1954 No. 1837

OCT 11 1954
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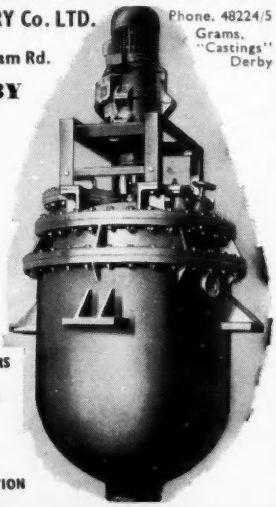

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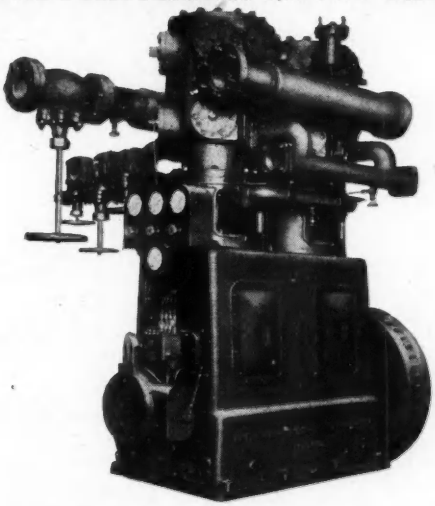

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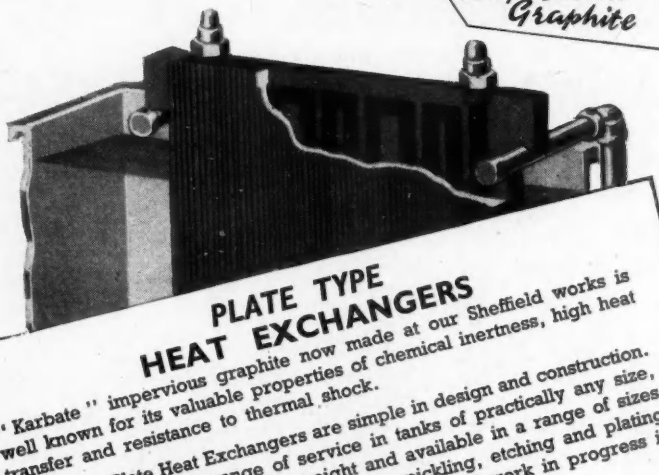

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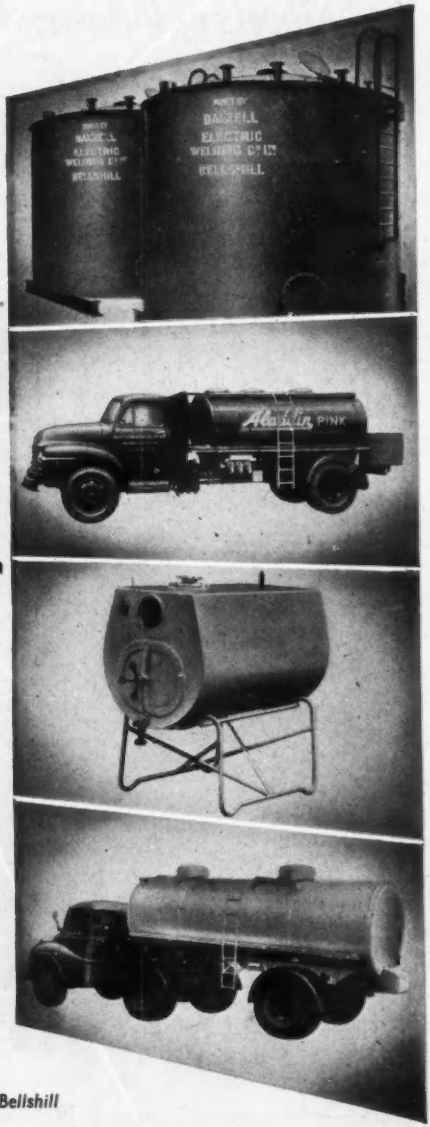

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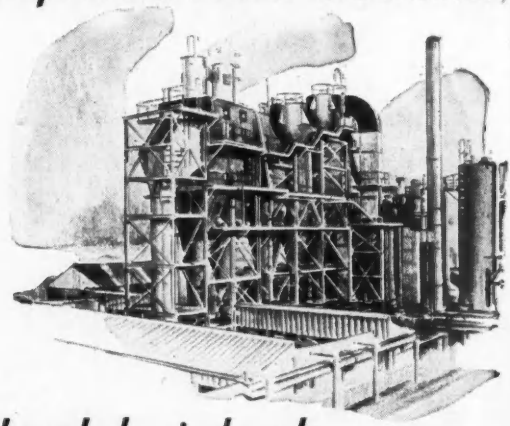

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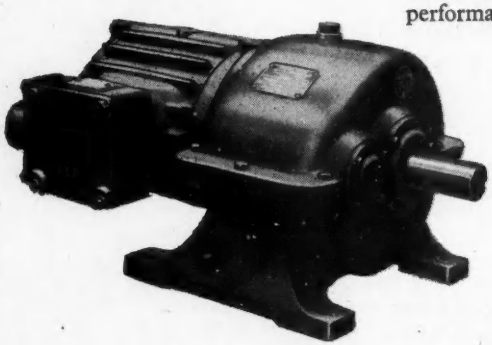

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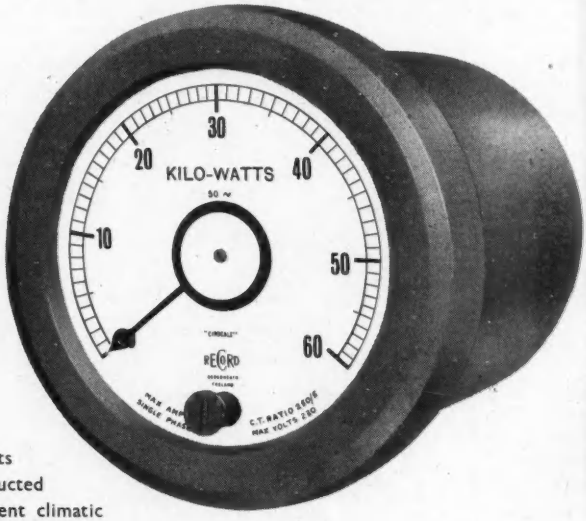

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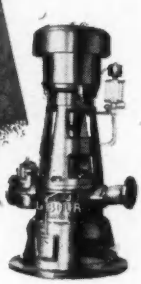

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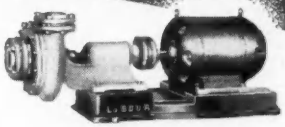

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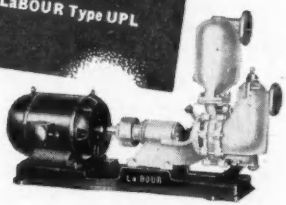

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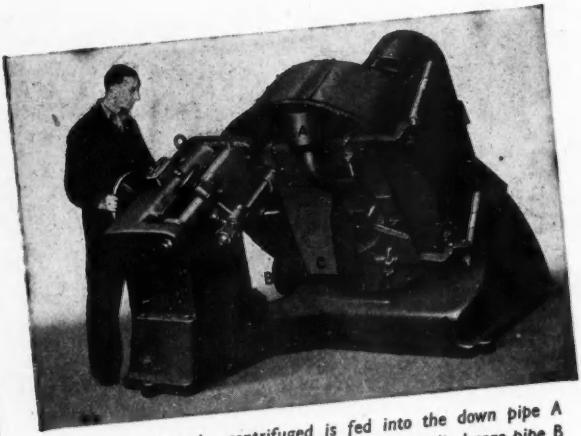

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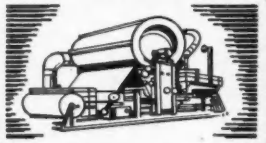

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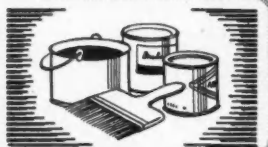

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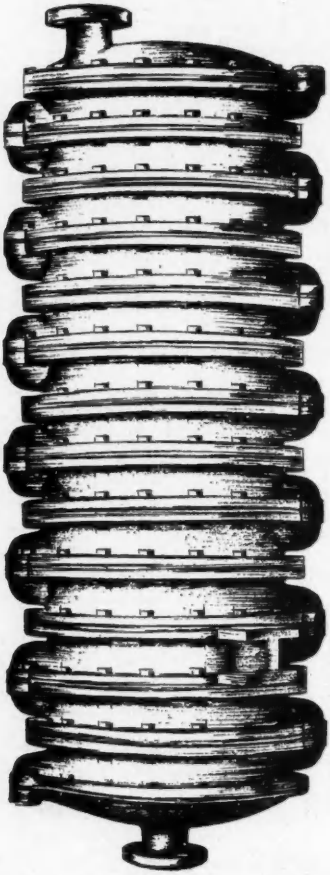

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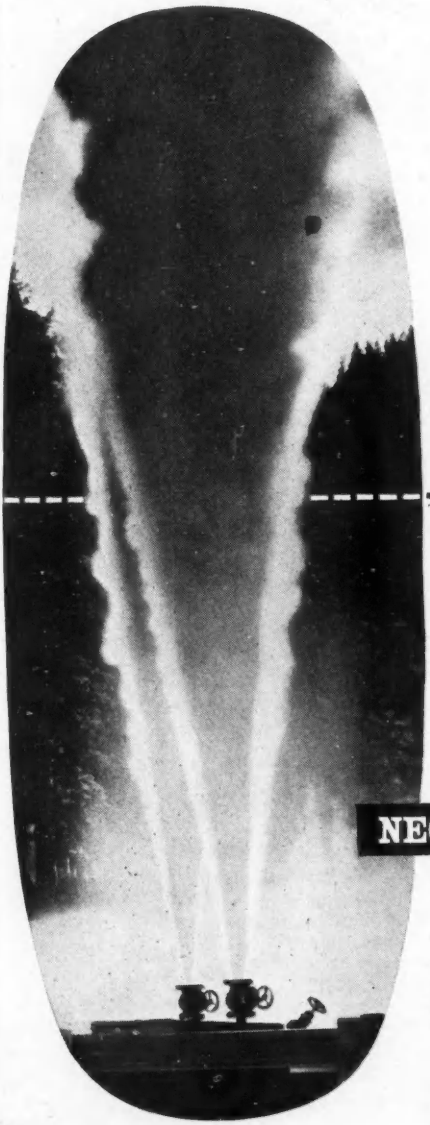

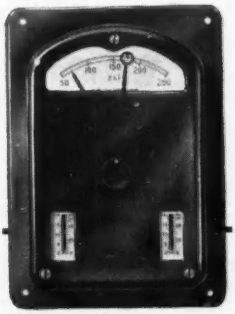

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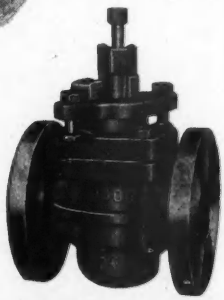

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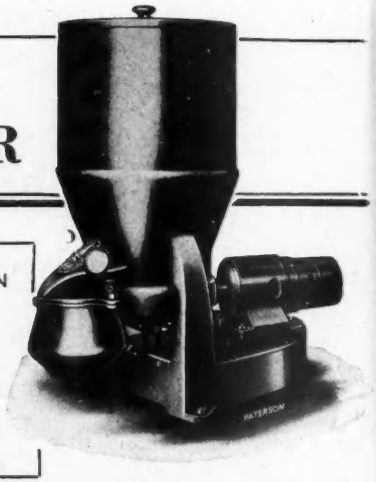

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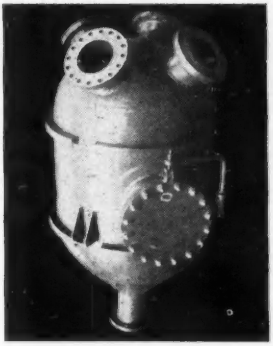

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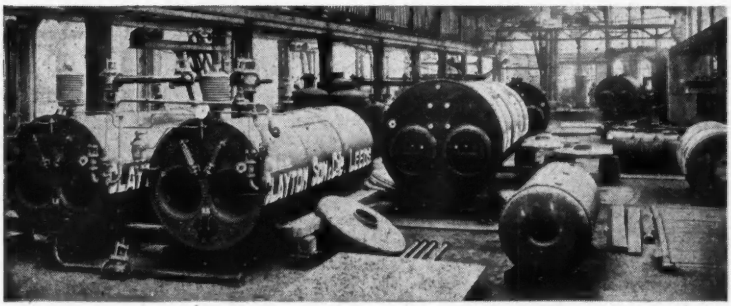

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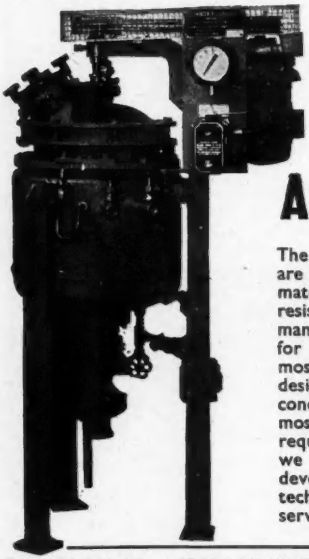

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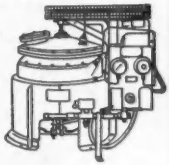

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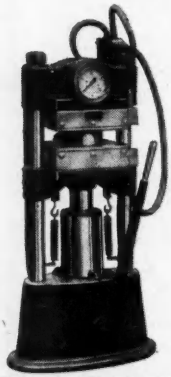

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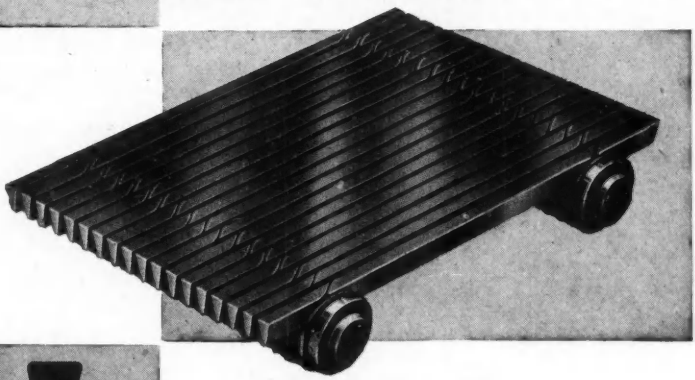

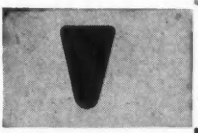

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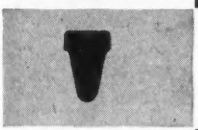

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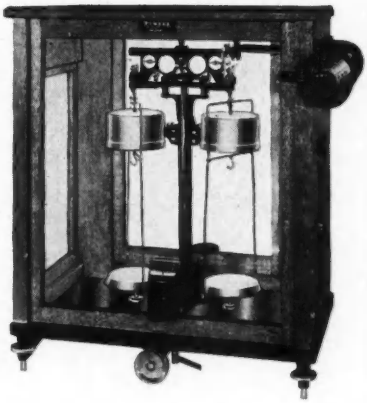

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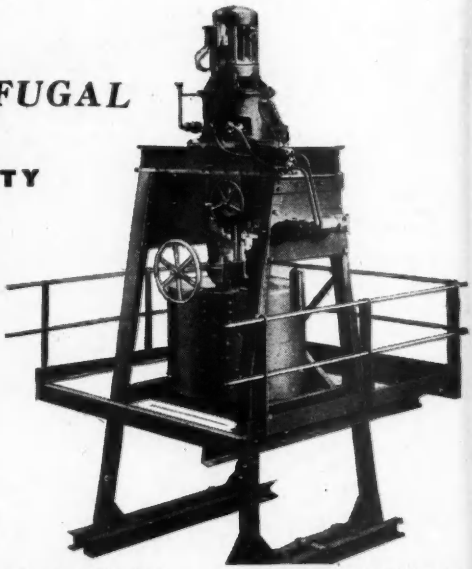

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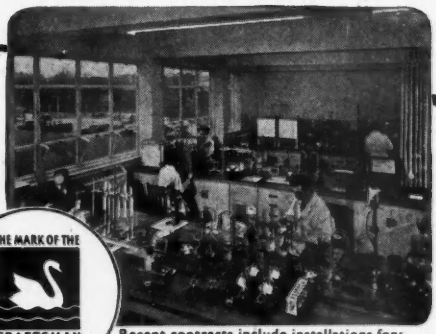

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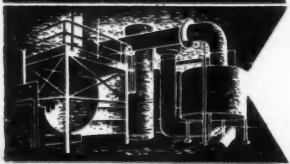

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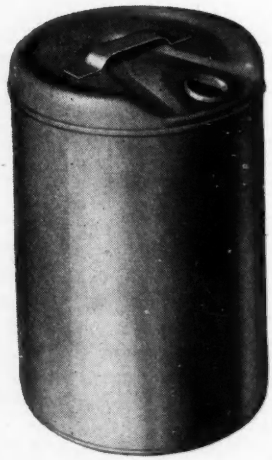

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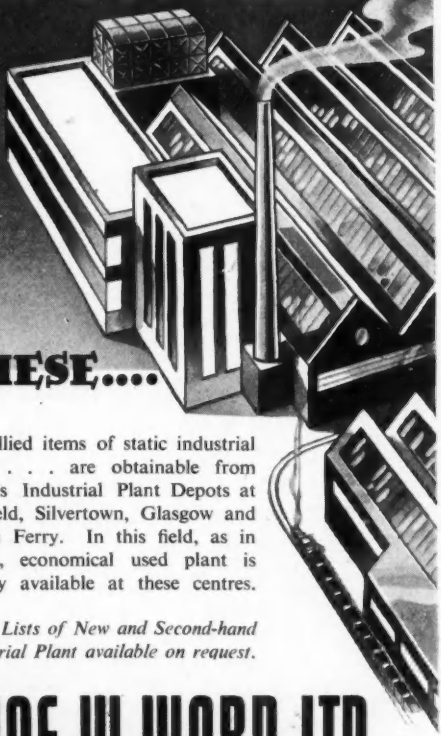

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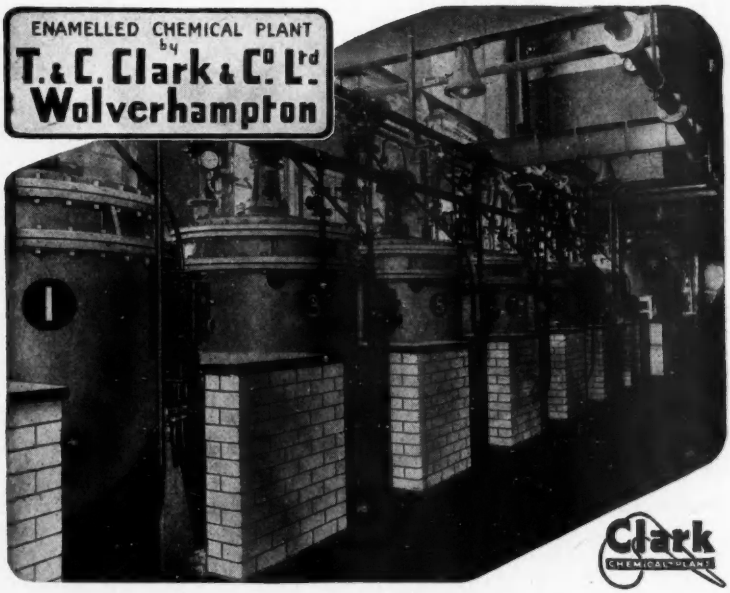

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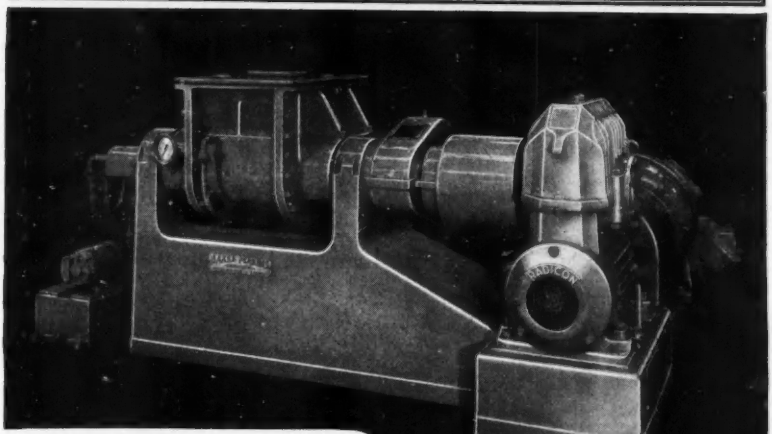

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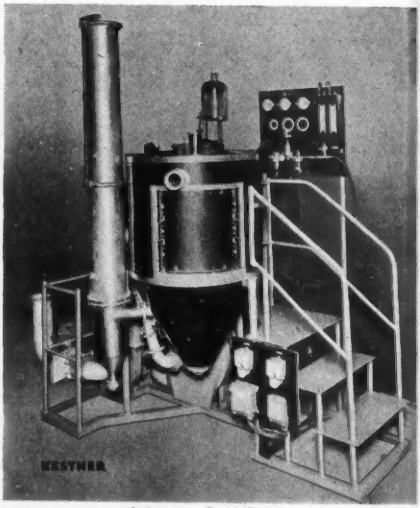

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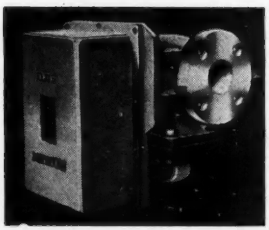

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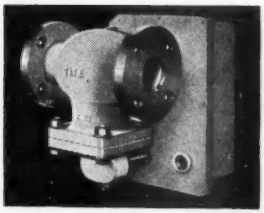

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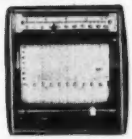

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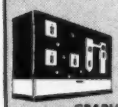

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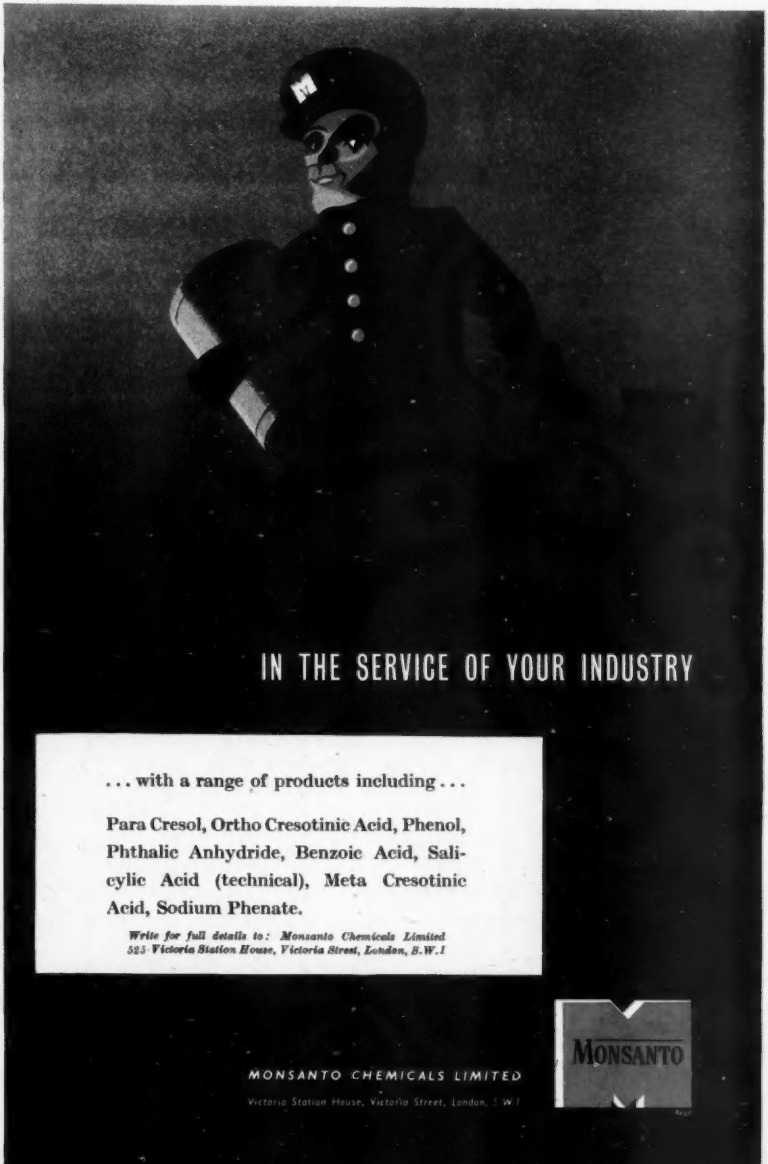
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American Trends

THE 126th National Meeting of the American Chemical Society ended only a few days ago in New York. Whether, like the 125th meeting at Kansas City earlier this year, it rivalled one of our own trades unions conferences for size, must wait upon reports, but an immense programme of symposia of papers and plant visits had already been issued early in August. In addition many non-ACS organisations also arrange meetings to take advantage of the fact that no similar opportunities occur for finding so many chemists and chemical engineers in the same place at the same time. The American predilection for bigness is well known, but these national ACS gatherings that are held twice a year are not mere exercises in size, and they genuinely reflect the great vigour and versatility of twentieth century US chemistry. Indeed, before any reports from the 126th meeting can reach us, we might usefully look back upon the 125th meeting a few months ago. These meetings provide as good a signpost as any to future directions in American chemistry and chemical industry, and often enough the briefer reports of discussions long precede detailed publication as papers in journals.

What trends were revealed earlier this year at Kansas City? One particularly worthy of comment was the range and vigour of the ACS Division of Analytical Chemistry's discussions, notable in these days when the basic weapon of analysis is taken for granted and generally dismissed in a few words of acknowledgement. The principal paper dealt with new chelating reagents selective and sensitive enough 'to distinguish between 1.0 and 1.1 milligrams of iron in a bath-tub of water.' Such substances are 1,10-phenanthroline and 2,2′-dipyridine, and all of them have the same group, =N—C—C—N= (ferroine), which forms 5-member rings with metals. The detection of trace elements in petroleum, today very important since such contaminants can poison the catalysts used in modern refining or petrochemical processes, has been re-approached. The standard approach of burning the oil and testing the residue is inadequate owing to losses by volatilisation, and it is now considered far better to extract the metals with sulphuric acid, followed by extraction again with hydrochloric acid, acetone, and water. Final evaporation of the extract is the prelude to spectographic measurement of the metal or metals. Zirconium determination has also made a step forward, stimulated by the element's greater use in atomic energy projects. The gravimetric method can be displaced by the use of an EDTA chelating agent which in an acid solution is said to form a stable Zr compound. A sharp end-point can be obtained with a visual indicator, and only five other metallic elements interfere with the basic reaction. This new method of determination requires only a few minutes as against the several hours needed for the standard and cumbersome method. It was also suggested that CDTA (1,2-cyclohexenediaminetetraacetic acid) may prove to be a superior chelating agent in analytical work to the better known EDTA; work at Iowa State College has shown that compounds formed with metals and CDTA are more stable than those formed with EDTA.

The production of chemicals from coal is still an important topic in America—

it was suggested that a further hydrogenation of the tar acids and high boiling oil fractions will increase the output of the more valuable phenol; and even more phenol per ton of coal could be obtained if the less-wanted cresol and xylenol are further hydrogenated. The flexibility of the basic coal hydrogenation process has long been recognised and it seems that the current phase in US coal-chemicals development is mainly concerned with the maximum exploitation of this flexibility.

Hydrazine chemistry is making particularly rapid progress, and here again the stimulus is industrial demand, both actual and potential. The initial interest in hydrazine as a rocket propelling fuel is no longer the single pace-making influence; several promising new agricultural chemicals are based upon hydrazine—weed killers, seed dressings, and fungicides. The two-step process for making hydrazine from chlorine and ammonia has been steadily improved. High yields of chloramine from the first reaction (chlorine and ammonia) can already be secured, and research work at Ohio on the second (condensation of chloramine into liquid ammonia) has shown that yields of hydrazine up to 80 per cent of the theoretical yield are attainable. Lower initial concentrations of chloramine and rather higher reaction temperatures than the −78° first imposed are yield-increasing factors. The presence of ammonium chloride in the reaction system is a yield-reducing factor. At Illinois the hypochlorite hydrazine process is being improved, the synthesis from pure *tert*-butyl hypochlorite and ammonia or urea being much easier to study in detail than the commercial synthesis reaction which uses sodium hypochlorite. The same research group reported that chloramine will react with amines and polyamines to give alkyl hydrazines, and that these reactions could be commercially developed.

In the field of sugar chemistry, the reductone compounds formed from sugars and amines during food storage have been isolated and studied. When formed in foods reductones act favourably as anti-oxidants and unfavourably as producers of discoloration and off-flavours. Piperidino-hexose reductone has been synthesised in USDA research by heating hexose and piperidine (in alcohol solution) under nitrogen and in the presence of acetic acid or another weak acid as a catalyst; yields of up to 30 per cent of the theoretical amount have been obtained after 12 to 20 hours of heating. Dextran synthesis from sucrose can now be closely controlled so that the molecular weights of the dextran fall within the range (25,000 to 200,000) that is suitable for use of dextran as a blood plasma expander. The use of low molecular weight dextran as a primer is a major influence, as is a reaction temperature of 15° or less.

The 'ageing' process for viscose or cellulose polymers, a degradation process usually accomplished by alkali-induced oxidation, can also be accomplished by ultrasonic energy. It is said that this mechanical method for breaking cellulose chains gives a much more uniform product than chemical methods, and there is a possibility that new cellulose yarns and filaments may be produced. However, it was regarded as unlikely that ultrasonic energy can be employed economically for large-scale manufacture, and the new process may prove in the end to be no more than a research tool for studying depolymerisation of cellulose chains. New fire-proof synthetic polymers have been made from tetrakis (hydroxymethyl) phosphonium chloride, which reacts much like a polyfunctional alcohol and combines with most substances that will combine with formaldehyde. Thermo-setting resins much like formaldehyde resins are obtained, but owing to the phosphorus content they have flame-proof and even glow-proof properties.

A notable feature of these national ACS meetings, revealed both by reports of the 125th meeting and the programme for the 126th, is the inclusion of divisions for chemical education, chemical literature (including nomenclature), the history of chemistry, and chemical marketing. It seems most commendable that these broad and perhaps somewhat ancillary subjects should have their regular 'airings'. The other method of treatment, via sub-committees of the scientific societies, resulting at the most in an occasional report in one of the journals or an even more occasional lecture, seems much less adequate.

Notes & Comments

Patience Rewarded

TWO items of news in the last few days have been particularly gratifying. The Medway College of Technology occupied its new buildings in mid-September and now possesses a 7½ acre site with a building capacity of over 1,500,000 cu. ft. This is the end-product of pre-war plans that had to be abandoned in 1939 and of changed post-war plans that had to be suspended when the Government's earlier policy of expansion and capital expenditure suffered restrictions. The second item of news concerns the DSIR's Water Pollution Laboratory which starts moving to its new premises at Stevenage on 1 October. At Stevenage there is a three-storey block, with offices and information section; micro-biological, chemical, and physical laboratories; and four pilot-scale laboratories with accompanying facilities for building larger plant in the open. At long last the post-war building plans of our scientific establishments seem to be achieving reality. We can only hope that many similar news-items will be reported over the next twelve months. British science is beginning to get the working-space it has so badly and patiently needed.

Insecticide Extenders

US Department of Agriculture research at the Beltsville centre appears to have increased greatly the durability of insecticides like DDT, gamma-BHC, and aldrin. Normally, of course, these substances have a reasonable persistence after application, but the use of very volatile solvents instead of oils for making up sprays is able to turn a period of days into one of weeks and even months. Methyl ethyl ketone is one of the volatile solvents which has been effectively used. The explanation seems simple enough. The rapid removal of the solvent after spraying leaves the insecticide residue fully on the leaf surface and without admixture with solvent; with oils, however, the residue on the leaf is not long-lasting because the oil tends to penetrate the leaf. A DDT spray based on methyl ethyl ketone was effective for longer than 60 days compared with only 15 days for a spray based on oil. With aldrin and gamma-BHC outdoor residue effectiveness was lengthened from less than 10 days to 102 days. During the tests weather conditions varied widely, temperatures as high as 27° and as low as −5° being recorded, and the residues endured 8½ inches of rain. With aldrin and gamma-BHC, both somewhat volatile materials themselves in comparison with DDT, methyl ethyl ketone alone was a less powerful 'extender.' The addition of a chlorinated terphenyl slowed down the rate of evaporation of these insecticides.

Other Effects

IT is possible, however, that these effects are not wholly due to volatility influences. The rapid disappearance of the carrier solvent after spray application—so rapid that some of the solvent is lost during the movement of the spray or mist through the air—converts the spray droplets into a precipitate of

British Chemical Plant

Each year we make it a practice to devote the bulk of one of the issues of THE CHEMICAL AGE to describing British chemical plant and equipment, and distributed throughout this week's issue readers will find details of some of the products manufactured by members of the British Chemical Plant Manufacturers' Association. In addition some of the more important contracts either recently completed or now in hand are mentioned briefly. For the convenience of readers a full list of the firms mentioned in our editorial columns, together with their addresses, is given on page 674. An index to advertisers in this issue is given on page 704.

minute pellets. As Rothamsted research here has shown, DDT toxicity is powerfully influenced by particle shapes and sizes. The test insects chosen for this work were flies, and further research will be required to check whether similar control extension can be attained for other insects.

Dissolving Phosphates

A PAPER just published in New Zealand (*NZ Journal of Science & Technology*, 1954, **36**, [1], 49) may have some importance in unravelling the mysteries of phosphate availability in soils. The plain truth is that after more than a century of phosphatic fertiliser development we still know exceedingly little about the chemical mechanisms that convert insoluble phosphate into available phosphate or those in the soil that prolong the state of availability. H. W. Johnston of the Soil Bureau (DSIR. NZ) has previously studied the phosphate-dissolving properties of various organic acids and found that these properties were more widespread than is commonly supposed. His second paper proves the indications in his first—that the most influential factor in 'solubilisation' is the structure of the acid, and that the α-hydroxy-aliphatic acids are pre-eminent in this capacity. Tri-calcium phosphate was used as the insoluble phosphate base in the experiments, and two different methods of measuring solvent power were employed—a standard shaking method and a standard leaching technique. The introduction of a hydroxyl group into an organic acid markedly raises the phosphate-dissolving power; this was found true for acetic acid, butyric acid, and even for the di-carboxylic acid series. The effect is at its peak when the hydroxyl group is in the α-position. However, to this last 'rule' there seem to be a few exceptions —pyruvic, oxalic, and citric acids. One of these exceptions is, of course, historically interesting, for the standard empirical solvent for phosphate tests in so many countries is citric acid.

Implications not Trivial

THE implications of this work for soil science cannot be dismissed as trivial or remote. The decomposition of crude organic matter in soils steadily produces small amounts of organic acids—and in some variety. How far do these acids control the interchange in a soil between soluble and insoluble phosphate, between the plant-useable coinage and the locked-up reserve? There is already a good deal of practical evidence that soils richly endowed with organic matter maintain a better available phosphate status. In view of the huge losses of phosphate in soils—rarely is more than 15 or 20 per cent of added phosphate recovered by crops—it is remarkable that fairly simple and fundamental research of this nature has not been carried out years before. There have, however, been some not dissimilar American investigations since the war (P. H. Struthers & D. H. Sieling, *Soil Science*, 1950, **69**, 205; D. H. Sieling *et al.*, *ibid.* 1949, **67**, 3), and it might not be unfruitful to try to extract the common ground of these papers and the new contribution from New Zealand. In a dark chapter of science any signs of light are worth following in the hope that they are not mere will-of-the-wisp enticements.

Kwinana Refinery Starts Next Year

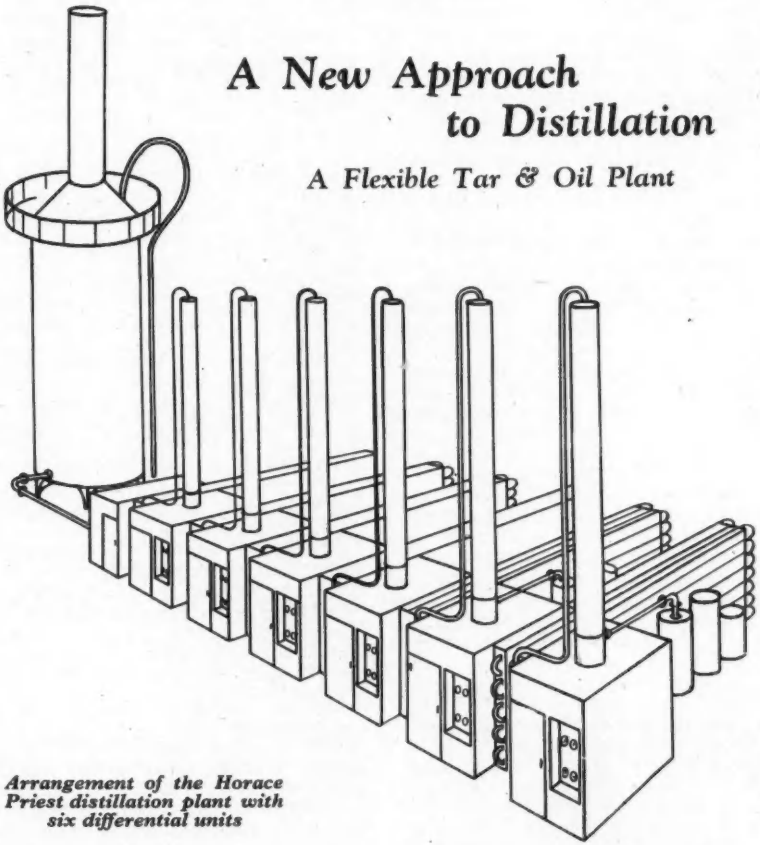
The first tanker bringing crude oil from Kuwait will berth at Kwinana refinery, Western Australia, soon after 1 January, 1955, and the refinery is expected to be commissioned in the early months of the year. The 950-acre site contains a modern refining plant, including two atmospheric distillation units, a vacuum distillation unit, a catalytic cracking plant, a platformer and a hydrofiner. Work is ahead of schedule.

Rand Carbide Ltd.

In a circular to shareholders the directors of Rand Carbide Ltd., of South Africa, say there has been some recovery in the demand for carbide for export in the past six months which has enabled production to be raised. However, in view of the limited improvement in the company's financial position, the directors have decided they would not yet be justified in considering the declaration of an interim dividend.

A New Approach to Distillation

A Flexible Tar & Oil Plant



Arrangement of the Horace Priest distillation plant with six differential units

TAR distillers, and many others, will be interested in a new pattern of distillation plant recently designed by Mr. Horace Priest, and manufactured by Horace Priest Chemical Engineering Co. Ltd., Horsham. The fruit of Mr. Priest's 20 years' experience of tar distillation plants, the new design breaks away from the orthodox methods.

Among the claims made for this plant are the following:

1. Uninterrupted production for 365 days a year.

2. Distillation of any number of different crudes, such as tar, crude tar acids, crude bases, naphthalene, benzole, benzolised wash oil, alcohols, or any other distillable crude, in the one plant at the same time, and the production of any number of distillates.

3. Operation as continuous plant, batch plant, or a combination of both at the same time.

4. Operation under vacuum, atmospheric or elevated pressures at the same time.

5. Concentration of all distillation processes into one plant.

6. Ability to increase capacity without installation of a complete new plant, or scrapping of the old one.

7. Heating coil which will not corrode, erode, or coke; no special steels being re-

quired, and no joints in the heating zone.

The plant consists of any number of differential units, according to the number of crudes and fractions to be handled. Each differential unit consists of an independent distillation system, which can be brought in and out of circuit at will, and can be used as a continuous or batch unit.

These units can be connected in series, in parallel, or in any arrangements to suit a particular requirement. Thus a plant can be small to start with, and only the minimum number of fractions catered for; and the capacity and scope of the process may then be increased as occasion demands.

Another important part of the design is the fractionating column, which is another of Mr. Priest's inventions and is of the bubble-cap type. Its construction, however, is claimed to have the simplicity of a packed column, being made in one piece without joints or flanges. The cost is said to be remarkably low. A large number of theoretical plates is possible; where six fractions are required, for example, it is possible to have more than 100 plates in the distillation process.

Pure Products Obtainable

Owing to the large number of plates, and the infinite reflux ratio, pure products can be obtained. The plant is therefore very useful in the distillation of small quantities of special crudes, or in pilot research, since any number of differential units may be isolated from the main plant without affecting its working. Where azeotropic distillation is necessary, the introduction of a third component can be effected without trouble.

Tar distillers have to deal with a very difficult crude, since it contains water, suspended solids and free carbon, and is corrosive and prone to decomposition. The customary pipestill subjects the crude to conditions which give rise to polymerisation and coking, but, in this new process, the crude is never in contact with the heating unit, and thus no breakdown occurs.

The heat transfer medium is a specially treated oil produced in the plant itself, and non-corrosive. It is also used instead of water for condensation of the reflux vapours, with a consequent reduction in fuel requirements and corrosion of the plant.

This new distillation plant is entirely self-contained, and for a process involving six fractions and a residue requires a ground space of about 70 by 16 ft. It is fully accessible, and no buildings or structural work apart from simple rafts is required. Mr. Priest has designed the units to utilise standardised equipment, and so any capacity plant can be manufactured and erected in a very short time, and altered at will.

Big Order for Scottish Firm

A SIX-FIGURE order for road tankers for Australia has been placed with the Dalzell Electric Welding Co. Ltd., Bellshill, Lanarkshire. The company have been exhibiting at the Scottish Industries Exhibition which closed on 18 September and their order is the biggest yet placed at either of Scotland's post-war trade fairs in the Kelvin Hall, Glasgow.

The tankers have been ordered by Mr. Arnold Lyons, a Glasgow man who founded the Sydney firm of merchants, A. Lyons & Co., after emigrating to Australia 20 years ago. Within a year 50 are to be sent. They are wanted for milk and beer and for transporting powdered and emulsion cement in connection with hydro-electric and other constructional schemes.

This is the first order for the direct export market that the company, formed only six years ago with a capital of £300, have received. The managing director, Mr. W. J. Anderson, said that it had come opportunely, because in the near future an extra 180,000 sq. ft. was to be added to the Bellshill factory.

Fall in US Chemical Sales

SALES of 29 representative American chemical companies fell slightly during the first half of this year, according to the current issue of *Chemical News*, organ of the US Manufacturing Chemists' Association Inc. The trend was general in all manufacturing industries, and net income actually increased from $337,000,000 to $369,000,000.

Total sales for all chemical and allied products up to the end of June were $9,900,000,000 against $10,000,000,000 for the same period last year. The chemical industry employed 790,000 men and women, who received an average of $77.33 a week for 41 hours' work.

The chemical industry is the sixth largest in the USA and the most rapidly growing. In the first half of the year an estimated $688,000,000 was spent on new plant and equipment, which since 1945 has accounted for over $10,000,000,000.

Oxo Process in Texas

Carbide & Carbon Building New Unit

CONSTRUCTION of a new unit to produce more than 60,000,000 lb. of chemicals a year by the Oxo process at the Texas City, Texas, plant of Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation, is nearing completion according to Mr. H. B. McClure, president of Carbide and Carbon Chemicals. This new unit at the Texas Ciy plant is one of the largest in the world employing the Oxo process for the synthesis of chemicals.

Using the extremely high pressure reactions of the Oxo process, a large family of new alcohols, aldehydes, and acids will immediately be added to the more than 400 synthetic organic chemicals now produced on a commercial scale by Carbide and Carbon. At the present time commercial quantities of seven new Oxo chemicals are already being produced in pilot plant facilities at the South Charleston, W. Va., plant of Carbide and Carbon. With the initial operation of the new large scale commercial unit the manufacture of many of these will be transferred to Texas City. Production of *iso*-octyl alcohol, primary decyl alcohols, and primary tridecyl alcohols is planned for the initial operation of the unit which is now scheduled to start in late October.

Principles of the Process

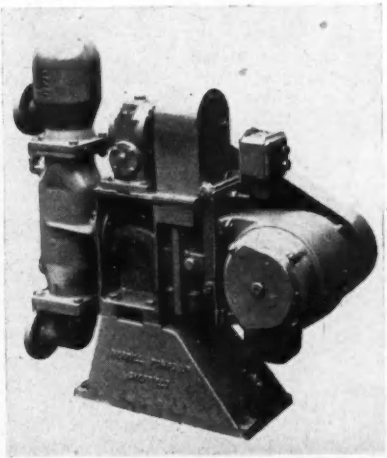
The Oxo process is based on the simultaneous reaction of carbon monoxide and hydrogen with an olefin. This yields an aldehyde that contains one more carbon atom than the original feedstock. The operating pressures range from 1,500 to 6,000 lb. per sq. in. and temperatures are approximately 200°. In the new unit the Oxo reaction can be carried out with any available feedstock from ethylene up to the high molecular weight olefines in the 15 carbon atom range.

Five new plasticisers based on these Oxo alcohols have been introduced within the past few months. This points up the importance of the higher alcohols in this large, fast-growing field. In addition, the Oxo alcohols can be used as chemical intermediates for a variety of applications. Reaction with dibasic acids, such as sebacic, adipic, and azelaic acids, produces esters useful as plasticisers and as components of low temperature lubricants and greases. These alcohols are intermediates for both nonionic and anionic surface-active agents by reaction with ethylene oxide or by sulphonation. Tridecyl alcohol is also used in preparation of tridecyl mercaptan used in GR-S rubber manufacture. Monomeric esters of the higher alcohols, such as the acrylates and methacrylates, are used to make speciality polymers and copolymers for coating resins and oil additives.

Versatile Pumps

DURING the last year, report Merrill Pumps Ltd., they have begun regular production of their size 50 diaphragm pump, which has a capacity of up to 50 gpm. The company exhibited at the Canadian International Trade Fair in Toronto, and received orders for pumps for handling slurries of uranium in nitric acid, slurries to filter presses at a gold mine, and aluminium sulphate at a paper mill.

Other exhibitions were the Utrecht Fair, and a show at Sydney. Orders executed or in hand include pumps handling hydrofluoric acid for etching electric light bulbs and cathode ray tubes, pumps with plasticised PVC diaphragms for handling hydrogen peroxide, and pumps to deal with acid rinsings, nickel-plating solutions, and weak sulphuric acid, at Royal Ordnance Factories.



Merrill size 12 pump, with flanged inlet bend and flanged outlet air vessel

Pipe Heating

New Electrothermal Device

A FURTHER addition to the range of flexible electric heating devices developed by Electrothermal Engineering Ltd. is a heating network sealed into a high temperature-resisting grade of PVC. It is completely waterproof and is intended to provide a simple and efficient means of heating pipes in exposed positions in plant.

The heater is approximately ½ in. wide and is available in 50 ft., 25 ft. or 12.5 ft. lengths for operation on mains or other voltages as required. The electrical loading for each size is 7 watts per linear foot. Each heater has a connector at each end, but it is only necessary to connect the supply to one. Up to four 50 ft. heaters may be joined to give a 200 ft. length and the supply fed to one connector only. A variety of temperature controls can be supplied, the choice depending on the requirements of each installation.

On pipes fitted with heat insulation, single tracing with the heater will give frost protection on up to 2 in. diameter pipes during periods as low as −17°. Pipes of larger diameters can be multiple traced or the heater can be wound on to them as a slow spiral. Pipes and other fittings can also be maintained at higher temperatures than those required for frost protection, i.e., where viscous liquids must be maintained above a certain temperature in order to keep them free flowing. A maximum loading of approximately 1 watt per square inch of pipe surface can be applied by close coiling the heater around the pipe.

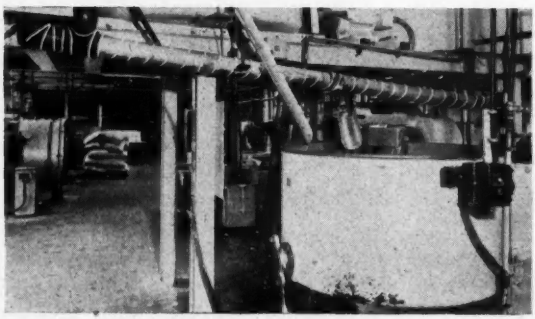
The heater is suitable for raising the pipe temperature up to 65°. The contents of the pipe may be allowed to reach a temperature of 100-120° without damage to the heater, but the heater must not be switched on during any period when the pipe temperature is above 65°. Another important use will be found for this new development as an immersion heater for maintaining the temperature of plating or pickling baths. The insulation is resistant to most inorganic salts and acids up to a temperature of 60° and concentrations of not greater than 50 per cent.

More Atomic Reactors

WITHIN 20 or 30 years British atomic energy plants will be producing enough electricity to save 20,000,000 tons of coal a year, according to a statement made last week by Sir Christopher Hinton, managing director of the Industrial Group of the Atomic Energy Authority. Sir Christopher, who was addressing the 27th International Congress of Industrial Chemistry at Brussels on 16 September, said the first stage would be the building of large numbers of nuclear reactors operating at relatively low temperatures, such as the two now being built at Calder Hall, Cumberland.

A new factory was well under way to make highly enriched uranium fuel. That would enable reactors to be built to use such fuel and capable of operating at higher temperatures, said Sir Christopher.

He added that new processes for reducing the quantity of radioactive waste products from atomic plants were being developed. In addition, progress was being made towards finding better methods of removing the plutonium, radio-isotopes and other wanted materials from the used atomic fuel.



Courtesy of The British Couverture Co., Ltd.]

An Electrothermal pipe heater used on a chocolate pipe line

Humidity Control in Packing

Use of Birlec Lectrodryers

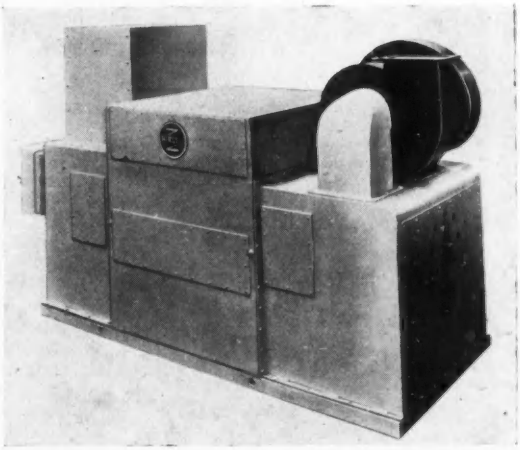
THE presence of uncontrolled amounts of moisture in liquid or vapour form is a problem of considerable significance to many branches of industry. It is a problem of particular importance to contractors for the Ministry of Supply and other large users whose demands frequently call for equipment which goes into long-term storage. The last war gave considerable impetus to the development of desiccant cartridges for absorbing moisture inside a package after this had been sealed or supposedly rendered airtight.

Experience has shown, however, that many of these methods are a failure when equipment is held in store over a period of years, particularly where the items involved are of an electronic or electrical description. This has led to insistence in a number of instances on the maintenance of constant low humidity conditions during the storage and packing of susceptible equipment which is not required for immediate service. This may mean modification of premises as well as the incorporation of means of controlling humidity.

Conventional air-conditioning plant, designed for large-scale use, is not always practicable or economical for dealing with an isolated packing department. A more effective solution is the method employed by Birlec Limited, Birmingham, in the range of equipment which they market under the name of Birlec Lectrodryers, for the removal of water vapour unavoidably drawn into the space through opening doors, evolved by the occupants, introduced by the material being handled or permeating through the walls.

Birlec Lectrodryer de-humidifiers are housed in a compact design of metal cabinet, which is delivered as a fully-assembled unit, and are built in graduated capacities to meet humidity control requirements on any scale. They incorporate multiple beds or trays of activated alumina, each of which is reactivated in turn by a flow of hot air while drying is maintained uninterruptedly by the others. Motor-driven air distribution valves control the adsorption/reactivation cycle, enabling a high rate of moisture removal to be achieved by a compact machine with low reactivation heat requirements.

Fans for dry air and reactivation air flows are incorporated in the machine and heating of the reactivation air may be by electricity, steam or gas, as preferred. Electric and gas heaters are equipped with control thermostats and necessary safety



A Model CHE Birlec Lectrodryer for maintaining constant low humidity conditions

devices while steam heaters are of the finned-tube type and are fitted with automatic traps and steam regulating valves. All heaters are efficiently lagged.

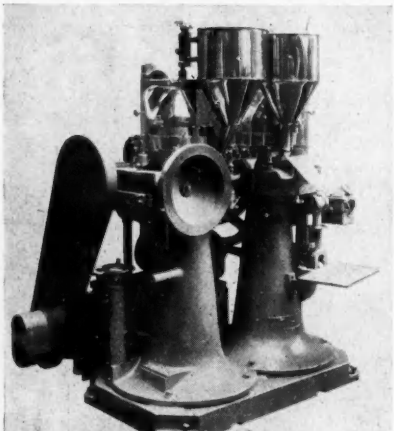
In addition other designs of Birlec Lectrodryer are used for the removal of moisture vapour from process gases and compressed air and in many other applications. Standard sizes are available with capacities of up to 15,000 cu. ft. per min., and special types can be provided for working pressures of up to 5,000 psi.

New Tablet Machine

Dry Coating by Manesty

THE 'DryCota,' made by Manesty Machines Ltd., is an entirely new machine for producing coated tablets by dry compression. This method ensures that the tablet is quickly covered by coating, thereby reducing exposure of material to a minimum and avoiding any risk of contamination. Coated tablets can be produced engraved or embossed, this being of great advantage when it is desirable to show trade or identification marks.

The machine is of robust construction and is made to precision limits. The first turret carries 16 pairs of punches and dies to produce the tablet centres, the material fed to this turret being from a large capacity hopper. The centre is picked up at the point of ejection by the transfer unit and passed to the second turret, where it is located centrally on top of the first fill of the coating material. Due to the special design of the transfer unit, the centre is held in synchronisation with the die of the second turret, thus ensuring perfect centreing.



Courtesy of Imperial College]

The Manesty 'DryCota' tabletting machine

The second turret also carries 16 pairs of punches and dies, which produce the coated tablet. The feed to this turret is from a large capacity hopper and special feed frame. The sequence of operation is first a filling of coating material, then insertion of the centre accurately and positively central in the die, followed by a second filling of coating material, the whole being finally compressed to produce the coated tablet. This method ensures a continuous output of evenly coated tablets.

Adjustments are provided for the depth of fill and pressure on both turrets within the capacity of the machine, and output control is by variable speed drive. All these adjustments can be made while the machine is running.

All parts of the transfer unit in contact with the material are made of stainless steel or are chrome-plated, to avoid contamination. The machine incorporates release mechanisms at all pressure points, to cater for any excessive overload on the machine. All cams and pressure rolls subject to heavy duty are of steel. Provision is made for lubricating all main moving parts of the machine.

A dust extraction unit is fitted to the machine—this ensures that the machine is clean in operation, and extraction nozzles are provided at the pressure points and also between the two turrets, thus minimising the possibility of loose impregnation of either the centre or the coating material from the transfer point.

Electric Motors on Show

The 1955 Electrical Engineers' Exhibition, to be held at Earls Court from 15 to 19 March, will have as its main theme the 'British Electric Motor.' There will probably be one-third more exhibitors than at the last show, and it is expected that the whole of the ground floor of Earls Court will be needed. During the exhibition there will be a late night, when it will be open until 9 p.m.

Raw Materials Handling

Sturtevant Improve Process & Reduce Labour

DURING the early part of the year an interesting new fertiliser bulk handling plant and store was completed by the Farmers' Manure Co. Ltd. at their Royston works.

Previously, the rail wagons of sulphate of ammonia, superphosphate and potash which arrived at the adjacent sidings had to be unloaded into open topped lorries. The contents were, in turn, discharged onto portable belt conveyors for stacking into the storage building adjoining the fertiliser granulating plant. The process was laborious, and proved difficult in inclement weather.

This experience led to careful thought being given to the problem of materials handling generally, with a view to improving the position, and the resulting solution was the erection of a completely new building constructed with reinforced concrete base walls and floor, and a steel superstructure clad in asbestos sheeting. This new storage building is adjacent to the existing fertiliser mixing and granulating

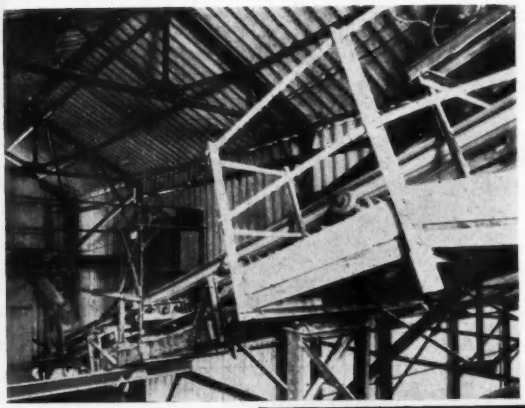


Fig. 1. First intake conveyor with Adequate weigher, located at centre of the storage building

Fig. 2. General view of inclined belt conveyor and shuttle conveyor in roof; sulphate of ammonia being discharged into store. The four materials reception bays can be seen, also the batching hopper and the end of the 30 ft. gangway separating the storage bays

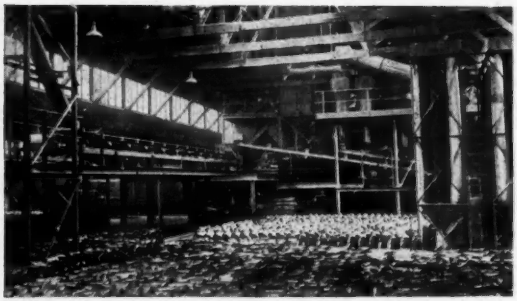


Fig. 3. Final belt conveyor feeding weighed material to the mixing and granulating plant

plant, and a track has been laid from the main railway into the works.

Twenty ton bottom hopper trucks are now used to bring the raw materials to the works, and are shunted in from the main line to the new siding where a Muir-Hill shunter is used to move them into position over a pit housing two belt feeder conveyors. The materials from the trucks are discharged through steel grids into large hoppers mounted above the belt feeder conveyors which discharge centrally into a revolving breaker. The discharge from the conveyors is controlled by a gate, and either one or both hoppers can be filled and discharged at the same time.

The fertiliser from the breaker is elevated and discharged on to a short, inclined belt conveyor in the roof of the storage building —an Adequate weigher being incorporated in the conveyor to record the amount of material handled. This conveyor is situated at the centre of the new storage building, which is divided into four materials storage bays by reinforced concrete retaining walls 12 ft. high, the bays being used for storing the three main NPK ingredients, and either triple superphosphate or other material.

A gangway approximately 30 ft. wide separates two of the materials reception bays from the other pair, and at one end of this gangway is a set of batching hoppers.

Returning now to the overhead inclined belt conveyor seen in Fig. 1, the material from this can be discharged by means of a two-way chute, either to a shuttle conveyor serving two of the four reception bays already referred to, or on to a second inclined belt conveyor in the same line, which spans the dividing gangway and discharges on a second shuttle conveyor, seen crossing Fig. 2, and serving the other two materials storage bays.

The 30 ft. wide gangway gives ample room to manoeuvre a Chaseside shovel to pick-up material from any of the four storage bays and to fill the batching hoppers, under which runs a narrow gauge railway. A truck under the hoppers passes over two Vandome and Hart dial type weighers, and half-ton batches of the mixture to be granulated are weighed and discharged on to a small belt feeder, thence to a vertical elevator. This elevator delivers on to a horizontal troughed belt conveyor passing from the new building, through a steel gantry, some 15 ft. above ground level, across the siding, to the existing granulating plant building—a distance of about 145 ft.

Fig. 3 shows the delivery end of this conveyor feeding the correctly proportioned ingredients to a troughed belt conveyor leading to the mixing section of the granulating plant prior to the actual granulation. This same conveyor also receives the dust, separated in the screening section of the granulating plant, for re-cycling.

From this description it will be seen that considerable economies in manpower and much easier handling of raw materials result from the careful thought given to the problems involved, especially as the intake side of the plant has a capacity of 40 tons per hour, and the batching and conveying section handles some 7½ tons per hour.

The building was to the designs of Arthur W. Whydale, L.R.I.B.A., of Royston, and the complete conveying plant was designed and installed by Sturtevant Engineering Co. Ltd., London.

The contract for the building was placed with Messrs. Jacklin, Hale and Co. Ltd., of Royston.

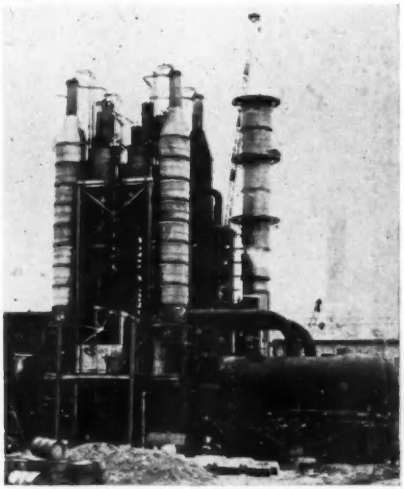
A Year of Considerable Activity

Extending the Scope of APV

THE past year has been one of considerable activity in the Chemical Engineering Department of The APV Company Ltd.

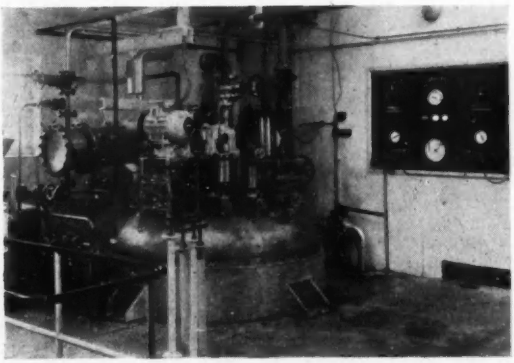
An outstanding order has been received from the Government of the Union of Burma for equipment to operate with the new pharmaceutical industry. This new industry is being organised by Evans Medical Supplies Ltd. of Liverpool. APV's part concerns the equipment for a distillery to produce alcohol of any one of a number of grades from rice. Les Usines de Melle's process is being employed for saccharification and, should it be required to manufacture absolute alcohol, their well-known azeotropic system will be used. The yeast factory is intended to produce dried yeast for medicinal purposes and the process has been supplied by Fermzymetera of Luxembourg. It is anticipated that the medical part of the factory will actually start production in the current year and that the distillery and yeast factory will be working in 1955.

At home the largest APV 'West' distillation column so far constructed has been put to work. This column contains 100 plates and was installed by Midland Tar Distillers Ltd., for continuous de-phenolation of their de-pitched and de-hydrated crude tar acids. The overhead is phenol with a C.P. over 40° and the effluent contains appreciably less than 1 per cent phenol.

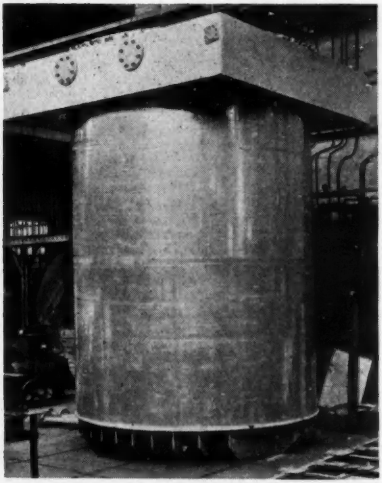


APV 'West' plate columns at Midland Tar Distillers Ltd., near Wolverhampton

Another interesting installation which has been set to work during the year is the synthetic resin plant for Blundell Spence & Co. Ltd., which is of a conventional pattern as far as its main operation is concerned but exhibits a number of detailed features which facilitate operation—in particular with re-



APV synthetic resin plant installed at Blundell Spence & Co. Ltd.



An 8 ft. diameter aluminium tank made by APV, with 1 in. thick reinforced bottom

gard to temperature control in the reaction vessel and satisfactory fume removal.

Interesting fabrication work undertaken by the company includes an aluminium tank approximately 8 ft. diameter, the bottom of which is 1 in. thick and reinforced by 1 in. aluminium webs welded direct to it. Although this base was not machined over the diameter the variation from flatness did not exceed ±1/16 in. The tank was argon arc-welded throughout.

The range of stainless steel valves made in agreement with Cooper Alloy Foundry Ltd. of America is gradually being increased. Improvements in the technique of manufacture are being instituted so as to facilitate a steady flow and to meet the growing demand.

US Manganese Ore

DOMESTIC mine shipments of manganese ore in May decreased slightly from April to 15,400 short tons, according to the Bureau of Mines, United States Department of the Interior. Shipments of manganiferous and ferruginous ore totalled 65,000 short tons.

Imports of manganese ore containing 35 per cent or more manganese totalled 218,726 short tons, an increase of 20 per cent over April as compiled by the Bureau of the Census. Of the total imports, India supplied 24 per cent, Cuba 22 per cent, Gold Coast 14 per cent, Union of South Africa 13 per cent, Belgian Congo 12 per cent, and Brazil, Angola, Mexico, Australia and Chile the remaining 15 per cent in decreasing order. Imports of ferromanganese, 7,974 short tons of ore equivalent, were more than double those of April. Total quantity of new material (domestic mine shipments plus imports of ore and alloys in terms of ore) increased 20 per cent over April to 242,100 short tons.

Production of manganese alloys (ferromanganese, silicomanganese, and manganese metal) increased slightly from April to 72,589 short tons. Industrial stocks of ore were again slightly lower than the previous month, while producers' stocks of alloys at the end of May were 12 per cent more than at the end of April.

Vacation Training

A SHORT conference with industrial representatives on vacation training for students of chemistry is to be held at the Royal College of Science, South Kensington, London, S.W.7, on 20 October. Among the suggested terms of refrence for the conference, which will last for the afternoon, is an examination of the experience of industry of the Imperial College of Science and Technology Vacation Work Scheme. Other aspects suggested for discussion include the question of the best stage of student life for vacation work in Britain and abroad, programme organisation and rates of payment.

Chairman of the conference will be Professor R. P. Linstead, C.B.E., F.R.S.

Institute of Metals Meeting

FOR the benefit of members of the Institute of Metals who were unable to take part in its 1954 autumn meeting in Switzerland, a special general meeting will be held at 4 Grosvenor Gardens, London, S.W.1, on 25 and 26 November, for the discussion of scientific papers. Non-members of the Institute will be welcome at this meeting, and tickets are not needed.

On 25 November there will be a discussion on 'The Constitution of Titanium Alloys' at 2.30 p.m. and on 26 November discussions on 'Preferred Orientation (10 a.m.) and 'Corrosion and Staining of Aluminium Alloys' (2.30 p.m.).

Extraction Equipment

by D. C. FRESHWATER, B.Sc., A.M.I.Chem.E.

(Department of Chemical Engineering, Birmingham University)

THE unit operation of liquid-liquid extraction has developed enormously in the last 15 years and is now recognised as one of the most important techniques for the physical separation and refining of industrial liquids. Most of this development has taken place in the fields of petroleum refining and uranium ore refining, and to a lesser extent in the final stages of antibiotics manufacture, particularly penicillin. This growth in importance began principally because liquid-liquid extraction proved to be the only method of processing certain materials such as lubricating oils, and continued as it was realised that the method could be extended to separations carried out previously by other means such as distillation which may have been more expensive to operate.

The advantages of extraction are the comparative simplicity of the equipment, its ease of operation and control, the wide choice of solvents available as extractive agents and the absence of heat consumption. This latter is not altogether on the credit side, since every extraction plant invariably is accompanied by stripping columns to remove the solvent from the extracted raffinate. No general statement is possible about relative overall heat consumption of extraction processes against distillation, absorption or adsorption techniques, but each case must be examined separately. An interesting comparison of several typical cases was made recently by Paris.[1]

The development of extraction as a leading unit operation has naturally led to intensive research on and development of the equipment used for the process. However, before going on to consider this in some detail it will be best to discuss briefly the theoretical principles underlying the design of such equipment.

Ideally, process equipment should handle with a high efficiency the largest possible throughput in the smallest given volume. At the same time it should be cheap to build and operate and should perform with constant efficiency and stability even a wide range of throughputs. Most of these desiderata represent conflicting demands and much of the skill of the designer consists in reaching a satisfactory compromise between them. However, probably the most fundamental consideration is the rate of mass transfer in the equipment.

The rate of transfer is proportional to a driving force (expressed in terms of a difference in concentration of the material being transferred from one phase to another) divided by a resistance. The nature of the resistance is as yet a matter of argument, but conventional theories consider there to be a stagnant film at each side of the phase boundary or interface through which the material passes only by the relatively slow process of molecular diffusion.

The rate of transfer may be expressed as:

$$N_A = K\Delta c \qquad (1)$$

where N_A is the number of moles of component A diffusing through a unit area of interface in unit time, Δc is the concentration difference in terms of component A in each phase and K is a proportionality constant which also includes the resistance term. Clearly in any given case we wish to make K as large as possible.

Rewriting this equation for each phase separately we have:

$$N_A = k_1 (c_1 - c_i) = k_2 (c_i - c_2) \qquad (2)$$

where k_1 and k_2 are film coefficients for each liquid film, c_1 and c_2 are the concentrations in the main body of the liquid and c_i is the interface concentration.

Assuming that equilibrium conditions obtain at the interface then we can write:

$$N_A = k_1 (c_1 - c_i) = k_2 (c_i - c_2) = K_E (c_E - c_E^*) = K_R (c_R^* - c_R) \qquad (3)$$

where subscripts E and R refer to extract and raffinate phases respectively, and it follows that where the distribution law holds, i.e., where m is independent of c_R^*, the equilibrium concentration:

$$\frac{1}{K_E} = \frac{1}{k_1} + \frac{m}{k_2} = \frac{1}{mK_R} \qquad (4)$$

This well-known derivation, based on the two film theory, combined with the basic rate equation is a useful starting point for a consideration of factors affecting the per-

formance of any extraction apparatus. The equilibrium relationships and the initial concentrations are fixed by the system to be handled and generally are outside the influence of the designer, except in so far as choice of solvent may be exercised or the effect of temperature or equilibrium relationships utilised. This leaves two main variables which the designer may try to change in favour of more efficient operation. These are the interfacial area of contact between the two phases, and the film thickness.

Interfacial Area

Clearly from equation (1) the greater the interfacial area, the greater the transfer, but the practical criterion is the interfacial area per unit volume of mixture. Theoretically it should be possible to predict this area from a consideration of the size of droplets in the dispersed phase. This has not been possible as yet, and in practice one uses a modified coefficient which is based on measured values of interfacial area in equipment of a type geometrically similar to that which is being investigated or designed. Neither the overall transfer coefficient or the interfacial area are measured directly but are expressed as K_Da or K_Ea values, depending upon whether they are calculated with respect to the raffinate or the extract phases.

Film Coefficients

Equation (3) shows that the overall resistance is a function of the sums of the individual resistances. In the majority of solvent extraction processes, each resistance is of the same order of magnitude for a given film thickness. Hence it is important in an extraction apparatus to reduce the film thicknesses and so the resistance to mass transfer. Again it is very difficult to measure film thicknesses and impossible in the types of apparatus used at present to determine interfacial areas and therefore, where film coefficients are used, they are generally of the combined rate and area type. Thus the two fundamental variables in extraction equipment performance are known only indirectly and then as a combined function. A possible method of approach to overcome this impasse will be mentioned later.

Extraction Equipment

So far, on mass transfer considerations alone it has been shown that extraction equipment must produce a large interfacial area and thin phase films. Before discussing how this is brought about, two important practical requirements must be mentioned.

All extraction processes are limited by the phase equilibria of the system as to the amount of extraction that can be accomplished in a single equilibrium contact and most actual processes require contacting in several equilibrium stages. Generally this is done most efficiently by countercurrent operation. The majority of commercial extraction processes therefore use continuous countercurrent flow of solvent and feed through a number of contacting stages. In addition the process, to be feasible, must operate throughout in the region of immiscibility of the system in question. Thus, whilst there must be provision for adequate mixing and contact of the liquids in each stage for the required mass transfer to take place, there must also be provision for the mixture to settle after contacting and separate into the phases which may then flow on to their respective next stages.

It is interesting to note that the problems of extraction equipment design are therefore concerned at least as much with fluid handling as with mass transfer.[2]

Any stage or extractor consists essentially of a mixer and a settler and many different designs have been used for accomplishing this function. However they may all conveniently be classified into three types as suggested by Davis *et al.*[3] These are:

1. Equipment in which the mixing and contacting is achieved by gravity flow of the two phases. Common examples of this type are the perforated plate and ring packed columns.

2. Equipment which utilises an oscillatory flow of liquid to effect mixing as in the pulse packed column or pulse perforated plate column.

3. Equipment where the mixing is achieved in individual action of a jet or impellor, and the phases separated either by gravity or centrifugal force before passing on to the next stages.

The last type exhibits the most variations in design. The stages may be vertical or horizontal. The stirrers may be mounted on a common shaft or each stage driven separately.

Further, the settling may be co-current in which the emulsion produced by mixing the two liquids passes to a single settling chamber where the heavy and lighter phases separate out and are passed to the next

stages. Or it may be countercurrent in which the emulsion passes to two settling chambers. In the upper chamber the lighter layer is withdrawn whilst the heavy layer is returned to the mixer and in the lower chamber the heavy liquid is withdrawn, the lighter layer being returned to the mixer. Finally in some designs it is possible to control the ratio of the two phases in the mixing chamber independently of the net flow rates through the system. This allows a greater residence time per stage for the phase which provides the greater resistance to mass transfer.

The different designs are too numerous to describe here but a few typical examples will be discussed whilst references are given to papers dealing with other types in detail.

Column Type Apparatus

Vertical columns fitted with some suitable contacting device, such as perforated plates or packing, are used widely for liquid-liquid extraction processes. This type of equipment is of more recent application than mixer and settler apparatus (the latter term generally being reserved for equipment in which the mixing is performed by mechanical means). Because of its simple and cheap construction and low operating cost, column apparatus with gravity flow has displaced mixer settler equipment in many fields. In its simplest form the apparatus consists of a tower through which flows a continuous phase whilst counter-current to this flow is a stream of droplets (the dispersed phase). The relative velocities are maintained by density differences. There is a provision for dispersing one phase and also a settling region at each end of the tower. This corresponds to the single spray tower in absorption but in practice such a simple apparatus has a very low efficiency due to incomplete mixing and coalescing of the original droplets, and plates or packing are inserted in the tower to maintain a high interfacial area and give better mixing. Types of plates common in distillation practice have also been applied to liquid-liquid extraction. Perforated plate columns of conventional pattern with downcomers and weirs have been used,[4] but recently some new designs have been published which omit downspouts and provide for more or less horizontal flow of liquid to allow for settling between trays. One of these designed by Bradley[5] is shown diagrammatically in Fig. 1. It is arranged for dispersion of the heavy phase at each set of perforations.

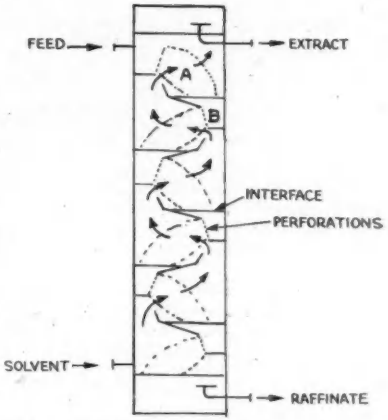


Fig. 1—Perforated plate column without downcomers

Contacting and mass transfer take place principally in the area marked A. B is a settling zone where the dispersed droplets coalesce and build up sufficient head to pass through the next set of perforations and so produce fresh interface for the next transfer stage. The flow of the light phase is shown by the amount. Other designs make provision for the dispersion of both phases at each stage but are necessarily more complex in construction.[6–11] Since the resistances to transfer in most commercial extraction systems are of the same order of magnitude in each phase the choice of dispersing either the light or the heavy phase is arbitrary. It is usual to make the cheapest or safest phase continuous because this cuts down the bulk of expensive or inflammable liquid which has to be handled.

Pulse Type Column

The principal features of this type are shown in Fig. 2. The piston of the pump is connected directly to the interior of the column and so its reciprocating motion is transmitted to the whole of the liquid in the tower. In operation a continuous layer of the light phase tends to collect below the plates to a similar layer of the heavy phase above the plates. The positive pulsations cause the lighter phase to be forced through the perforations and form individual drops

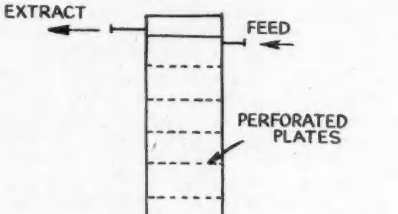


Fig. 2—Pulse-type perforated plate column

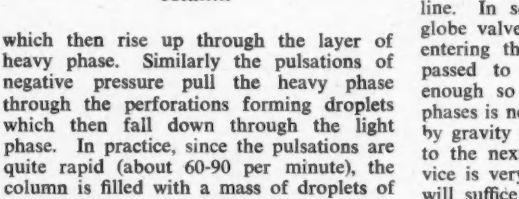
which then rise up through the layer of heavy phase. Similarly the pulsations of negative pressure pull the heavy phase through the perforations forming droplets which then fall down through the light phase. In practice, since the pulsations are quite rapid (about 60-90 per minute), the column is filled with a mass of droplets of each phase flowing through alternate layers of lighter and heavy phases and very efficient contacting is obtained.[13]

While the above description has been confined to perforated plate columns, the same apparatus may be used just as effectively with packing such as rings or saddles replacing the plates. This type of apparatus is still in a development stage and as far as is known has not been used on a commercial scale. An interesting account of a pilot plant pulse column separating rare earth metals appeared recently, and, in general, this design would appear to have much promise.[12–15] It would seem to be a more efficient method of supplying the energy required for the production of fresh interface to mixing than the use of paddles, centrifugal pumps or rotors.

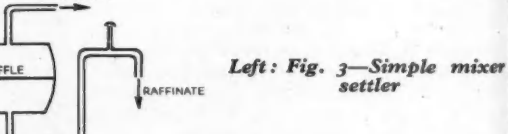
Mixer-Settler Equipment

Here we have the greatest variation of design and also the oldest type of equipment.[16] In its simplest form a one stage unit comprises a mixing device coupled to a settling tank as shown in Fig. 3. The mixing device in this case is activated by the kinetic energy of either or both the liquids flowing through it and may be of the familiar injector pattern or simply a series of segmental baffles inserted in a pipeline. In some instances a partially closed globe valve suffices to mix the two liquids entering the pipe. The mixture is then passed to a tank with a volume large enough so that the flow velocity of both phases is negligible. Thus separation occurs by gravity and the two new phases pass on to the next apparatus. Such a simple device is very cheap and easy to operate but will suffice only for relatively easy separations, i.e., where there is a large driving force and a small resistance to transfer. A considerable refinement of this idea is seen in the Holley-Mott washer shown diagrammatically in Fig. 4.

The mixing is brought about by means of a mechanically-driven stirrer and in addition there is a recirculation line from the base of



Left: Fig. 3—Simple mixer settler



Right: Fig. 4—Holley Mott 3-stage washer

each settler into the mixing tank. The rate of recirculation may be controlled by a valve in this line and thus the ratio of the two phases in the mixing tank may be varied. The overall flow from stage to stage is by gravity. Because of the efficient mixing and recirculation the Holley-Mott washer has a high stage efficiency. However, it is relatively expensive to operate because of the individual stirrer equipment and also requires a large floor space compared with column type equipment.

In an attempt to overcome these disadvantages Van Dijck proposed the arrangement shown in Fig. 5.[17]

It comprises a cylindrical shell mounted at a slight angle from the horizontal and equipped with a central shaft carrying a number of paddles or stirrers. Each paddle rotates within a chamber formed by perforated plates covering the whole cross-section of the cylinder. Between each chamber is a settling space wth a circular baffle which allows the heavy and light phases to pass through the annular spaces at the bottom and top of the cylinder respectively. The flow through the apparatus is by gravity and depends on the tilt of the cylinder and the density difference between the phases.

The logical extension of this idea is the vertical column with a central rotating shaft. There appears to be a trend for modern mixer settler extraction apparatus to be of this form and two particular designs are noteworthy.

The first is the rotating disc column due to Reman[18] and now in use commercially. This is shown in Fig. 6. The arrangement is similar to the familiar 'disc and doughut' baffled distillation or absorption column but in this application the discs rotate. Very efficient contacting is claimed for this apparatus. The speed of rotation and the power consumption are both quite low and many stages can be contained in a single unit which occupies only a fraction of the space required by older types of mixer-settler equipment.

A somewhat similar design was proposed independently by Scheibel.[19] In this apparatus the stationary baffles are replaced by sections of packing which act both as contacting and settling zones.

The need for separation by extraction of liquid mixtures which decompose readily or which tend to form emulsions has led to the design of centrifugal extractors. A feature of these is the low hold up, i.e., rapid processing time, and the availability of a force several times that of gravity to aid in the settling of the two phases. Typical application for such machines are in the field of antibiotics where small amounts of valuable products which may be relatively unstable are solvent extracted from a fermented broth. Two successful designs are due to Podbielniak and Luwesta and both are well described in the literature together with modifications which have been proposed.[20–23]

Conclusions

It has been possible to describe only a very few of the many different devices which have been proposed or actually tried as ex-

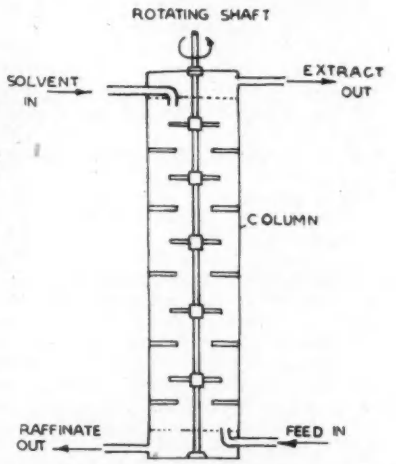


Fig. 6—Rotating disc-type extraction column

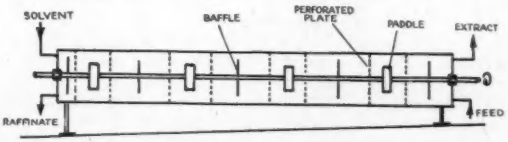
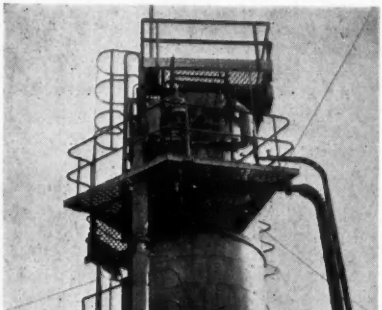


Fig. 5—Van Dijck horizontal rotary extractor



Courtesy Shell Refinining & Marketing Co. Ltd.]

The rotary disc contactor Luboil plant at Shell Haven Refinery

tractors. If one examines the whole field, the feature which stands out perhaps more than any other is the emphasis on the function of mixing in the different designs.[24–31] Now there is a relationship between the mixing energy put into the extractor and the fundamental variables of interfacial surface. To produce fresh surface requires the energy represented by the surface tension between two liquids. If the exact form of the relationship between mixing energy and interfacial surface were known, it would be possible to predict the available transfer area in a given apparatus. This problem has as yet hardly been more than propounded, but it is one of the most important and fundamental, not only in extraction, but in the allied operations of distillation and absorption.

Large scale liquid-liquid extraction is a much newer operation than distillation or absorption, with which it has so much in common. However, there is little doubt of its growing importance—for example, in a recent review of the unit operation, Treybal[34] gives 114 references to papers which appeared in the previous year on process applications alone. There is much scope therefore for development and application of process equipment. Nevertheless it must be remembered that seldom, if ever, does an extraction process stand on its own; it is coupled with distillation units to recover the solvent from the extract and raffinate phases. Moreover the number of theoretical stages used in most processes rarely exceeds five. Thus both the capital and operating costs of extraction alone are small compared with the total process costs and the differential between various types of equipment is likely to be small.

REFERENCES

[1] Paris, A., *Industrie Chimique*, 1953, **40**, 97.
[2] Ross, T. K., and Freshwater, D. C., *Chem. & Proc. Eng.*, 1954, **35**, 190.
[3] Davis, M. W., Hicks, T. E., and Vermeulen, T., *Chem. Eng. Prog.*, 1954.
[4] Mayfield, D. F., and Church, W. L., *Ind. Eng. Chem.*, 1952, **44**, 2253.
[5] Bradley, T. M., USP. 2,642,341 (1953).
[6] Bacsik, G. J., USP. 2,615,792 (1952).
[7] Casler, J. R., and Nelson, C. C., USP. 2,609,276 (1952).
[8] Keck, D. R., *Chemistry in Canada*, 1952, **4**, [6], 44.
[9] Langmyhr, G. J., USP. 2,628,894 (1953).
[10] Packie, J. W., USP. 2,610,108 (1952).
[11] Tickler, R. B., USP. 2,614,031 (1952).
[12] Sege, G., and Woodfield, F. W., *Chem. Eng. Prog.*, 1954, **50**, 396.
[13] Stephens, R., *Chem. Eng. Prog.*, 1953, **49**, [7], 340.
[14] Cohen, R. M., and Beyer, G. H., *Chem. Eng. Prog.*, 1953, **49**, [6], 279.
[15] Werning, J. R., and Higbie, K. B., *Ind. Eng. Chem.*, 1954, **46**, 644.
[16] Morello, V. S., and Poffenberger, N., *Ind. Eng. Chem.*, 1950, **42**, 1021.
[17] Van Dijck, W. J. D., USP. 2,266,521 (1941).
[18] Reman, G. H., USP. 2,601,674 (1952).
[19] Scheibel, E. G., *Chem. Eng. Prog.*, 1948, **44**, 681.
[20] Eisenlohr, H., *Ind. Chem.*, 1951, **27**, 271.
[21] Steinacker, P., and Hemfort, H., USP. 2,622,796 (1952).
[22] Ger. Patent 819,977 (1951).
[23] Steinacker, P., and Boyng, J., USP. 2,665,061 (1954).
[24] Mcnamara, T. L., USP. 2,609,277 (1952).
[25] Dutch Patent, 70,866 (1952).
[26] Carney, C. S., USP 2,628,894 (1953).
[27] *Idem.* USP. 2,614,064 (1952).
[28] Nagata, S., Egachi, W., and Tokoyama, T., *Chem. Eng. (Japan)*, 1953, **17**, 20.
[29] Dunn, R. W., USP. 2,630,376 (1953).
[30] Valmien, F., French Patent 874,250 (1942).
[31] Fenske, R., and Long, B., USP. 2,667,407 (1954).
[32] Heftman, T., and Johnson, K., *Anal. Chem.*, 1953, **25**, 1578.
[33] Work, R. S., and Buck, J. W., USP. 2,659,664 (1953).
[34] Treybal, R. E., *Ind. Eng. Chem.*, 1954, **45**, 91.

Good Mixers

THE design and capacity of many of their machines have recently been improved, announce William Gardner & Sons (Gloucester) Ltd. For instance, their double cone blender has been in demand, and is regularly manufactured in sizes up to 15 ft. in diameter. This machine is for the dry mixing of products liable to damage in mixers with integral agitators.

The company's drum mixer, which mixes by means of vanes and scoops, is now available in sizes up to 20 ft. diameter.

Worldwide Chemical Engineering

Work of Simon-Carves & Subsidiaries

DURING the past year several companies of the Simon Engineering Group have been concerned with a number of chemical engineering contracts of interest and importance.

Prominent among them are the two large sulphuric acid/cement plants which are now nearing completion, one for Imperial Chemical Industries at Billingham and the other for the United Sulphuric Acid Corporation at Widnes. Both these plants will produce sulphuric acid and cement clinker from anhydrite, using the process developed at Billingham some 25 years ago by Imperial Chemical Industries, who have provided the specifications for plant design and construction. Anhydrite is available in ample quantities in Britain, and these two plants, with annual capacities of some 75,000 tons and 150,000 tons of acid respectively, will make a substantial contribution to British sulphuric acid production independent of imported materials.

Simon-Carves Ltd. are the main contractors for the construction of both plants, and Simon Handling Engineers Ltd. are responsible as sub-contractors for the handling, storage, drying, weighing, blending and grinding equipment required for the anhydrite and other raw materials used in the process, and for the handling and storage of cement clinker.

First Kachkaroff Process Plants

Simon-Carves Ltd. are also carrying out contracts for the first two plants to be built in this country for sulphuric acid production from spent oxide by the Kachkaroff process, for which they are licencees. The first plant, now nearing completion, has been built for the South Eastern Gas Board at Phoenix Wharf adjacent to the East Greenwich gasworks, where Simon-Carves Ltd. are also building an extension of 22 ovens to the 66 coke ovens already in service. The second Kachkaroff plant is being built near Chesterfield for the East Midlands Division of the National Coal Board.

Among other Simon-Carves sulphuric acid plants under construction are two of the 'contact' type which are being built by Simon-Carves (Australia) Pty. Ltd. at Adelaide and Cockle Creek, both of which will use Australian pyrites: these plants, with capacities of 300 and 100 tons per day respectively, will supply acid primarily for fertiliser production.

Main Contractors at Portishead

In a different field from sulphuric acid, Simon-Carves Ltd. are the main contractors for the civil engineering, building construction and plant equipment of the new Albright & Wilson phosphorus factory at Portishead, now practically completed. Simon Handling Engineers Ltd. have supplied two quayside travelling pneumatic suction plants for discharging bulk cargoes of phosphate rock from ocean-going ships, a method which is widely used for imported grain but has not previously been applied to phosphate rock; the two Simon plants are believed to be the largest of their kind in the world outside the grain trade.

Two plants for the South Eastern Gas Board are being built by Chemical Engineering Wiltons Ltd., a Simon-Carves subsidiary company. One is a sulphate of ammonia and aqueous ammonia plant at Phoenix Wharf not far from the Simon-Carves coke ovens and Kachkaroff acid plant already mentioned; the other is a tar distillation plant at Ordnance Wharf.

Other Wilton contracts in progress include a complete new tar works for the East Midlands Division of the National Coal Board at the Avenue coke oven site near Chesterfield, a tar distillation plant at Caerphilly for the South Western Division, and a tar distillation plant for Dorman, Long & Co. Ltd. at Port Clarence. Among the firm's overseas work is an ammonia concentration plant which is to be erected in conjunction with Simon-Carves (Africa) (Pty.) Ltd. at the City of Johannesburg gasworks.

Huntington, Heberlein & Co. Ltd., another well-known Simon-Carves subsidiary, have been active in the development and supply of flash roasters and Badische 'turbulent layer' roasters for pyrites-burning sulphuric acid plants of both their own and Simon-Carves construction. A large number of flash roaster and waste heat boiler

installations have been put into service in the past year or two, and 'turbulent layer' roasters are incorporated in (among others) one of the Simon-Carves sulphuric acid plants in Australia mentioned above.

Two Huntington Heberlein 'wet contact' plants are at present under construction for the production of sulphuric acid from hydrogen sulphide, the gas being derived in one case from a coal gas liquid purification system and in the other from ammonium sulphate saturators. In these plants of the latest Huntington Heberlein type the tubular condenser used in earlier designs for the condensation of sulphur trioxide is replaced by a condensation tower followed by electrostatic or mechanical precipitation of the acid mist; waste heat recovery can be practised by using a waste heat boiler as a gas cooler between the hydrogen sulphide combustion chamber and the converter.

Trial Filtration

PUT into commission a few weeks ago by Davey, Paxman & Co. Ltd., was the rubber-lined portable filter unit shown in the illustration. This is an addition to the range of portable demonstration filter units which the company have available, both in this country and some overseas territories, to enable them to carry out full-scale long-term filtration trials at clients' sites. These tests can be conducted under actual operating conditions and provide an opportunity of installing the most suitable vacuum filter for any given process.

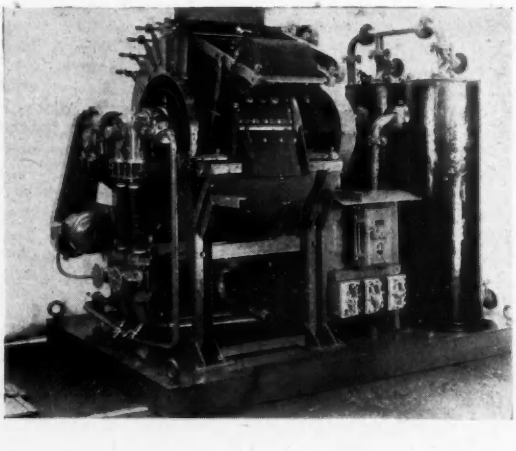
The filter is one of a range of continuous rotary vacuum filters, which are continuous in operation, have low power consumption and require a minimum of semi-skilled supervision.

Crookes' Annual Conference

A WELCOME from the directors was given in the opening address by Mr. G. E. Watson, general manager, at the outside representatives' annual conference of The Crookes Laboratories held at the Hotel Rembrandt, London, S.W.7, earlier this month. In the chair was Mr. J. R. Bowden, general sales manager. Mr. T. Webster, one of the representatives, was this year's president. Mr. Bowden gave a warm welcome to overseas representatives from Singapore, Pakistan and India.

Mr. M. J. Bizeray, home sales manager, Mr. R. H. H. Symonds, advertisement manager, and Mr. R. Jones Pugh, veterinary department, led discussions on subjects appropriate to their departments, and Dr. A. R. H. Hicks gave two lectures on 'The nervous system,' the first dealing with anatomy and physiology, and the second with the action of various drugs.

At the end of the conference, the Crookes Laboratories annual dinner was held at the same hotel. Captain R. C. Kelly, chairman of the board, replying to the toast of 'The directors and company,' proposed by Mr. Webster, thanked the outside representatives for the successful year's trading they had achieved.



Davey, Paxman & Co.'s 10 sq. ft. rubber-lined portable vacuum filter for tests on site

Corrosion in Chemical Plant

by T. K. ROSS, Ph.D., M.I.Chem.E., A.M.Inst.F.

(Department of Chemical Engineering, Birmingham University)

THE importance of corrosion study is never far from the minds of chemists and engineers whose responsibility it is to build, maintain and operate chemical plant. However, significant advances in corrosion theory do not always suggest the key to the plant problems which abound in industry. The difficulty largely centres around the complexity of the production situation, and this is often responsible for the apparent conflict between theory and experience.

It is not sufficient then to know that 'A' resists 'B' in order to solve all the constructional problems of a commercial unit producing 'B.' What is more helpful is to have a clear, if simple, idea of the phenomenon upon which 'A's' resistance is based and then to examine the manufacturing process for conditions tending to prejudice or destroy this protection.

Corrosion testing and research are invaluable in fixing the nature and extent of the basic protection as well as discovering destructive factors. Process design and chemical engineering analysis of production delineate the modifying factors to be applied to laboratory tests.

Chemical Immunity

Some metals resist some corrosive conditions through pure chemical immunity, although such cases are rather rare in practice. Absolute immunity is probably unknown, but the noble metals, for example, have a high degree of immunity. This is due to an equilibrium between the metal and its ions which occurs at exceedingly small ionic concentrations. Thus we may consider the problem in a very simplified form when a bivalent metal (M_e) is attacked by an active monovalent substance (X). A corrosion process entails the dissolution of M_e and its dissipation as ions among the attacking environment (liquid or gaseous) in which X exists. The formation of metallic ions requires the consumption of the liberated electrons, and if these cannot escape from the system by other means they will be consumed in the formation of X′ ions at the metal surface.

Now, if the metal M_e has 'noble' properties, the equilibrium

$$M_e + 2X \rightleftharpoons M_e^{++} + 2X'$$

will occur when an extremely small number of M_e^{++} ions are formed, and so the attack suffered by the metal is immeasurably small. A rough measure of this tendency to nobility is obtained by the potential which the metal attains when exposed to a normal solution of its ions. The deposition of ions on the surface of the metal in attempting to attain equilibrium will result in a positive potential on the metal, and the greater this deposition the more positive the potential. These potentials, measured against the hydrogen electrode are available in the normal electrode potential series, which thus provides a simple guide to the nobility, or probable resistivity to attack, of the metals.

Attack by Acid Solutions

In the case of attack by acid solutions, the equilibrium will be formed between hydrogen and its ions and metal and metallic ions, as, for example when X is supposed to be present as its hydracid (HX), which by dissociation provides H ions and X ions. Here again, the noble metal possesses immunity because the final equilibrium $M_e + 2H^+ \rightleftharpoons 2H + M_e^{++}$ is arrived at with an infinitesimally small formation of atomic hydrogen.

It can be seen that in such cases the immunity rests upon the attainment of equilibrium, and factors which prevent this can result in a loss of immunity. Thus, should the M_e^{++} ions be lost from the conditions portrayed by evaporation, by formation of soluble complexes, by precipitation of insoluble compounds, by the continual replacement of the attacking environment or by the acceptance of metal ions into complex anion or cations, the attack could proceed to a serious extent. Similarly, in the case of acid attack the continual consumption of hydrogen by a trace of oxidising agent in the attacking medium would result in continued metal dissolution.

Comparatively few metals enjoy chemical immunity, but some which have lower elec-

trode potentials than would indicate such immunity are, none the less, protective in special circumstances. Thus lead, nickel, and tin are more resistant to attack by acids than their position in the electrode potential series would suggest. These instances are examples of a very general phenomenon known as the overpotential, or over-voltage, of liberation of hydrogen. Simply stated, this results from some obstacle to the discharge of gaseous hydrogen at the metal surface. Various theories have been proposed to explain this effect, but whatever its true cause the result is of definite importance in corrosion work. The result of the additional EMF necessary to cause hydrogen gas to evolve from the metal surface is that if the metal itself is unable to overcome this additional potential, hydrogen evolution, and thus metallic ionisation also, will cease.

It will be obvious that resistance based upon this kind of protection will disappear if any other variable capable of reducing the overpotential is introduced into the system. For instance, oxidising agents would consume the hydrogen at the metal surface, thus allowing corrosion to proceed. Similarly, inclusions or other irregularities in the metal surface, which might provide areas of reduced overpotential, would cause hydrogen evolution and consequent corrosion, as would contact of the metal with any other surface of low overpotential. On the other hand, mechanical depolarisation could occur if the attacking solution was flowing rapidly past the metal surface, or if it contained a certain amount of inert, but abrasive material. This phenomenon of overpotential is also known to occur with other ions than hydrogen, and various types of corrosion are arrested by its intervention.

Protection by Corrosion

If, in the hypothetical cases previously described, the metal has neither immunity, nor protection by virtue of overpotential, then corrosion will continue and the attacking phase will continue to acquire metal ions. If this proceeds unchecked, the metal will have a short working life. If, however, the corrosion product were not removed from the metal surface, but were allowed to accumulate in the form of a coat or film, the corrosion might be abated. Protection due to this cause is very common among engineering materials, and it is interesting to note that it is often the result of extreme reactivity between a metal and its surroundings, as distinct from previous cases of limited reaction.

The probability of a material developing this kind of protection must be assessed for a given set of conditions. The first requisite is either that the corrosion product itself should have limited solubility or volatility in the attacking liquid or gaseous phase, or that it should be reacted to form a secondary corrosion product possessing such properties. That the solvent is of equal importance with the corrosive solute is illustrated by the case of the attack of iodine solutions upon silver surfaces. If the solvent used is capable of dissolving silver iodide, the attack proceeds, but if it does not do so the rapid formation of a silver iodide film on the silver surface checks the attack almost immediately.

Nature of the Film

Film growth then becomes an important matter in corrosion, and it is to be expected that the nature of the film will be a controlling factor. Obviously, a dense, strong film adhering closely to the metal will give better protection than one which is porous, brittle or inclined to flake or blister. Again, the behaviour of the film at various temperatures will decide the range of usefulness of the material. Even if the film has quite suitable physical or mechanical properties, however, quite different degrees of corrosion protection may develop as a film grows, dependent upon certain other important properties of the film substance. The chief factor is that the film is interposing a resistance in the series of events leading to the formation of M_eX_2 from M_e and X. It is necessary that ions of M_e, as well as electrons, are passed through this film to the outer surface where film growth continues, and this transport of ions and electrons can only take place under the impress of existing concentration and potential differences. So, even if the film is capable of permitting this transport, the sheer increase of its thickness, in interposing a continuously increasing resistance to this process, will lessen the rate of attack. In such conditions then, typical corrosion curves, expressing loss of weight per unit area against time, will have parabolic characteristics as distinct from the rectilinear type of curve which results when no film formation takes place.

This gradual stifling of the attack may give place to a much more rapid reduction in corrosion rate when the film has certain other properties. If, for instance, the film corrosion product is incapable of transmitting metallic ions, or electrons, in the appropriate direction the stifling action will develop more rapidly. Either one of these properties of low electronic conductivity or poor ionic transport will suffice to produce a film capable of halting the attack while still very thin. Instances of this behaviour are found in the case of aluminium, which forms films whose electrical conductivity is low, or zinc or chromium, whose filmed surfaces are obstructive to further ionic migration.

This discussion has assumed the general case of a film of corrosion product growing to become the controlling factor in the attack. Of almost equal importance, however, is the resistance based upon either a previously formed film, or one formed during exposure to corrosive conditions but not directly by them. Thus, the air-formed oxide films on some materials are the source of their resistance, while the maintenance and repair of these films is dependent upon oxidising conditions being present while they are under attack. In selecting such materials it is very important to be clear as to the actual constituent in the system which results in a protective film, for such protection is absolutely conditional upon the presence of such a constituent. Also other factors which militate against the stability and soundness of the film, such as thermal expansion, strain or erosive conditions, will have a direct bearing on the suitability of a given material.

Variable Surface Properties

These processes of equilibrium, overpotential and film growth are the ones controlling the corrosion or protection of a metal surface exposed to a potentially destructive environment. In these cases the movements of ions and electrons are concerned, so that it is proper to regard all such processes as electrochemical in nature, although the electrochemical cells are often very small, and even varying in position. That is to say that the portions of the surface providing metallic ions (the anodic areas) are quite close to the adjacent areas where the liberated electrons are consumed (the cathodic areas). Further, obstruction of anodes by corrosion products, or of cathodes by overpotential, may cause different sections of the surface to alternate between one role and the other, as time passes.

Although there must obviously be some small difference in potential between the two small active areas, the total resistance introduced by the short metal path and the ionised environment is so small as to prevent this becoming very great.

However, a great deal of dangerous corrosion occurs in practice when portions of a metal surface a measurable distance apart are able to acquire a sufficiently great difference in polarity as will enable the wastage of metal to proceed. This process demands a relatively good conduction path through the environment as well as electrical contact between the metal surfaces.

Differences in Polarity

It would be obvious enough that chemical immunity, overpotential phenomena or film growth rates could be adversely affected by changes in potential of the metal surface, but less obvious—and therefore more dangerous—is the fact that differences in polarity about a metal surface may produce attack in seemingly innocuous and nearly neutral conditions. Such differences in polarity may arise for various reasons, some external to the system, and some within it.

Problems of the first kind arise where structures in contact with the earth are subject to the effects of stray currents from neighbouring direct current electrical systems. This 'stray current' type of attack results when the current is able to establish a conducting path between the conductor proper, and nearby pipes or other metalwork. The areas where electrons enter and leave the metal then become anodic and cathodic respectively. At the former metallic ions are formed which besides reacting with the surrounding soil to produce voluminous corrosion products are only formed with an equivalent wastage at the metal surface. Similarly at the cathode area hydrogen, alkali metal or other ions may be discharged, so that a zone of increased alkalinity gradually develops. This may result in a secondary form of attack if the metal is less resistant at increased *p*H values, as, for example, in the case of lead or aluminium. The formation of masses of corrosion product may have two results; first,

the resistance of the established path may be increased so much that the current shifts its path slightly and sets up a new anode; second, the expansive forces resulting from the formation of bulky products may produce serious defects, as in the case of stray current in steelwork or reinforcement in concrete.

Stray Current Sources

The most serious sources of stray currents are the electrified rails of traction systems, although other heavy DC users such as electrochemical processes are troublesome in this respect. The replacement of DC with AC has in most instances reduced the extent of this form of electrolytic attack, but the amount of damage due to AC itself, although always much less, is still rather an unknown quantity.

This form of corrosion is perhaps not very widespread in factories or chemical plant, for the possibility of its occurence is obvious and it may be prevented altogether by suitable design. However, where it does occur its depredations are usually great, for quite substantial currents may flow in such a system. The amount of wastage to be expected may be assessed from the electrical equivalence of the metal concerned. Iron, for example, will be lost at the rate of 1 g. for each ampere hour; the same current would remove half as much aluminium, five times as much lead, or three and a half times as much copper. The distribution of this gross rate of loss is also important, for if it falls upon a small area the penetration will be much more severe than if it were evenly distributed over a greater surface.

Perhaps of greater importance to the engineer are cases where differences of polarity arise without any obvious applied external EMF but as a result of some difference of condition in the system itself. A corroding system consists, as we have seen, of the metal and the surrounding gas or liquid. We have seen also that certain conditions or properties must be fulfilled if the corrosion is to proceed. Many kinds of corrosion arise because of variations in these properties between various parts of the system, such variations being in the properties of the metal surface or the corroding phase.

The electrode potential series predicts that a current will flow between two metals of different standard potential when they are in electrical contact and in a conducting solution. The more electro-positive (or noble) metal should consume electrons provided by the more negative of the pair, which would then suffer loss of ions, or corrosion.

The rate of this dissolution is predicted by Faraday's Law, and the corrosion ratio predicted by this relationship will persist unless the corrosive solution becomes exhausted or the polarisation at one or both of the active surfaces increases.

In the latter case the effective potential of the process is reduced by the formation of a particular state of surface, e.g. that caused by the accumulation of corrosion products at the anode, or of increasing *p*H at the cathode. The polarisation of a metal surface is also affected by the current flow, and the general tendency is to render the cathode less noble and the anode more noble as current density increases. Some protective measures aim deliberately at increasing polarisation of one surface or the other, but without such direct action polarisation may not be sufficient to halt the attack.

Dissimilar contact corrosion also occurs between alloys of slightly different composition, or between portions of metal with identical composition but of different metallurgical histories. Thus, differences in polarity are known to occur between adjacent components of plant when the alloy compositions have not been carefully matched or where the heat treatment has varied, or when fabrication has imposed work hardening on some portions of the surface.

'Ennobling' Film

Now these phenomena do not have to be present throughout massive sections, as all that is required is a particular state of the surface in contact with the corroding solution. Such differences may arise because of a local variation in composition which encourages the formation of a durable 'ennobling' film, so providing a cathodic spot; such variations might conceivably exist between neighbouring grains at an alloy surface. For similar reasons protection based upon a previously acquired surface film may develop a penetrative type of corrosion if the film is fractured. The protected surface may then behave cathodically towards the damaged area and, unless polarisation phenomena intervene, pitting may ensue.

The actual potential of a metal surface in equilibrium with a solution of its ions is related to the normal electrode potential by the Nernst Theory.

If two surfaces of a metal at identical states were in contact with portions of a solution of an electrolyte at two concentrations, a potential would exist between the two surfaces. Under such circumstances equilibrium will not exist until dissolution of the metal at the anode has equalised the concentrations. Related types of corrosion do occur when two vessels electrically connected by pipework contain solutions of the same electrolyte of various concentrations. Similar considerations also show that variations in temperature throughout a plant may produce potential differences even if concentration changes are not significant.

Occurrence of Depolarisation

From what has been said previously, it is obvious that the continued functioning of active areas of corrosion is to some extent controlled by the polarisation characteristics of the cathodes and anodes concerned. In an earlier section the particularly persistent type of polarisation connected with hydrogen evolution was described. This phenomenon, which is associated with cathodic areas, of course, may virtually dominate corrosion rates when the hydrogen ion concentration of the solution is low. Such conditions of near neutrality then provide instances of cathodic behaviour developing at those portions of an immersed metal surface which are able to depolarise themselves. This may be effected purely mechanically (by circulation, for example) or by the presence of some surface impurity capable of evolving hydrogen. However, the most usual means of depolarisation is by chemical oxidation of the hydrogen—particularly through the medium of dissolved oxygen. When this oxygen content is acquired by surface solution from the air with or without a significant amount of circulation in the liquid, the distribution of cathodic areas becomes restricted to those zones able to obtain dissolved oxygen.

Very many instances are encountered in practice where the unequal availability of depolarising oxygen results in connected surfaces of different polarity, and hence corrosion occurs in seemingly harmless conditions. Much of this attack is a result of design or position, for any structure or item of plant which combines contact with an electrolyte with unequal depolarisation will be subject to attack. It is the least accessible portions of the surface which, becoming anodic, suffer attack; the remaining 'aerated' areas being cathodic are generally protected by the increase in *p*H which develops around them. Flanged joints, the undersides of rivet and bolt heads, buried portions of steelwork or pipe lines, the lower portions of tall storage tanks and similar situations are subject to this form of corrosion.

In concluding this brief review of some of the basic requirements for the corrosion or protection of metallic surfaces, it may be stressed that it is an appreciation of these features which provides the most workable basis upon which experience can be built and through which the diverse results of practice may be related.

International Foxboro

THE first International Instrument Congress and Exposition opened in Philadelphia on 13 September. At this exhibition, the largest and most important of its kind yet held in the US, a range of instruments made by Foxboro-Yoxall Ltd. in Britain were displayed alongside those of the Foxboro Company of America.

The British examples shown emphasised the complete interchangeability of the British- and American-built instruments and sub-units, and the consequent benefits to supply and service problems throughout the world.

Foxboro International will hold a conference of their export representatives at the well-known winter resort of Garmisch in the Bavarian Alps, from 4 to 8 October.

The conference will be attended by representatives from all parts of Europe and offers an opportunity for a social meeting as well as the discussion of a full agenda, which includes such items as the training of customers' own instrument maintenance men and problems of supply and service in the many different countries now supplied by Foxboro.

The conference will be opened by Mr. B. H. Bristol, president of the Foxboro Company, and Mr. L. S. Yoxall, managing director of Foxboro-Yoxall Ltd. The latter will be accompanied by Mr. B. W. Balls, chief chemical engineer, and Mr. R. Doyle, export manager, of Foxboro-Yoxall Ltd.

Electrode Drying Ovens

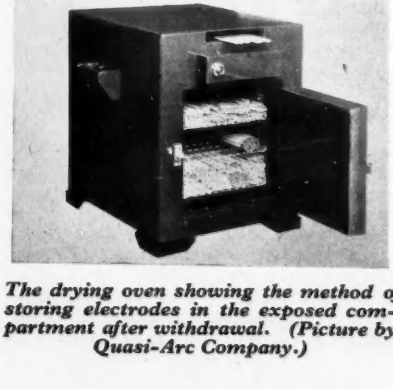
Developed by Quasi-Arc Company

THE Quasi-Arc Company Limited, Bilston, Staffordshire, have developed a specially designed oven for drying electrodes on site. It is especially desirable when the low hydrogen type of electrodes is being used.

The maximum capacity of the oven is 230 lb. of electrodes, and in its design particular attention has been paid to producing a readily portable unit which can be stationed close to the welding operator or to a group of operators. Facilities are provided so that when bundles of electrodes are taken from the oven they can be stored for immediate use in a compartment with open access, thus avoiding bundles of electrodes which have been dried in the oven being placed on benches, floors or site work.

The ovens have also been designed so that they can be stacked one above the other if capacity for a greater quantity of electrodes is required at one point. The handles are sufficiently robust to allow for lifting by crane even when the oven is full of electrodes.

The temperature range is 85/175°, and the temperature can be set at any value within this range. The thermostat is preset at 150° maximum. This maximum temperature has been established after careful testing by the Quasi-Arc Research and Development Department because it is adequate to drive off any hygroscopically-absorbed moisture but, at the same time, it is not so high that it will affect combined water—which is necessary in the covering of some electrodes—and furthermore, at temperatures exceeding 150° some types of electrodes (notably those containing organic materials, such as cellulose) could be seriously damaged. Thus the Quasi-Arc electrodes drying oven is safe in use in that it will dry off any absorbed moisture in electrodes without causing damage to electrode coverings.



The drying oven showing the method of storing electrodes in the exposed compartment after withdrawal. (Picture by Quasi-Arc Company.)

US Ferroalloy Output Up

PRODUCTION and shipments of ferroalloys in the US in 1953 reached record figures, reflecting increased steel production, reports the US Bureau of Mines. The increased output of ferromanganese was especially noteworthy. Manufacturers of ferroalloys added several new units to productive capacity; particularly important were plants designed to produce low-carbon ferrochromium.

In 1953 ferroalloys were made in 12 blast-furnace plants, 39 electric-furnace plants, four aluminothermic plants, and two miscellaneous plants. Ferromanganese produced in 1953 again averaged 77 per cent managanese. Output was from an aluminothermic unit, electric furnaces, and blast furnaces; the latter contributed nearly three times as much material as the others combined. Production of spiegeleisen increased 67 per cent as compared to 1952; however, shipments were virtually the same during both years. The average manganese content of spiegeleisen produced in 1953 was 19 per cent. Output of silico-manganese increased 5 per cent compared with 1952.

In spite of a substantial increase in production of ferrosilicon (including silvery pig iron) the silicon alloys were in second place for the first time in many years because of an even greater increase in output of ferromanganese. The average silicon content of the ferrosilicon produced in 1953 was 33 per cent. Production data include silvery pig iron, ferrosilicon of various grades, and ferrosilicon briquettes.

Imports of ferromanganese and ferrotungsten increased compared to 1952 trade; there was a very substantial increase in imports of low-carbon ferrochromium. On the other hand, exports of ferroalloys declined compared with those of the previous year.

Versatile Centrifugal

New Broadbent Model

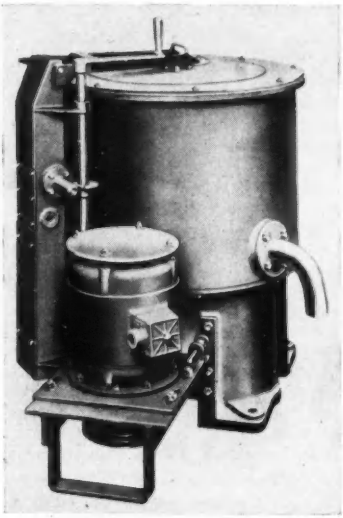
THOMAS Broadbent and Sons Ltd. have introduced a new 21 in. (basket diameter) bolted-down centrifugal, the Type 86, which is adaptable for various chemical processes and extremely useful for laboratory pilot plant work.

It is specially designed for manufacture in suitable corrosion-resisting materials to cover a wide range of chemical applications and it is possible to change the basket and outer casing in a very short time to increase its useful range still further. This is achieved by mounting the outer casing on to the heavy, rigid base by setscrews and securing the basket to the spindle by one spindle nut.

The drive is by vee belt from a vertical flange-mounted motor combined with an automatic centrifugal clutch pulley, and the self-balancing cover is electrically and mechanically interlocked to safeguard the operator. It is impossible to open the cover whilst the basket is revolving.

A special feature of this centrifugal is the heavy base casting which is designed for rigidity and strength to counteract the effect of out-of-balance loads at high speeds. The electrical interlock gear is totally enclosed in a column arranged vertically at the rear of the machine, and is therefore free from the corroding effects of acid fumes, etc.

The totally-enclosed electrical interlock and switchgear are also useful when flameproof equipment is required and should there be any risk of explosion in the centrifuging process, it is only necessary to substitute a suitable flange-mounted flameproof motor.



The new Type 26 Broadbent centrifugal has totally enclosed electrical interlock and switchgear

The top is bolted to the outer casing and can easily be adapted for separating liquids from solids by the spill-over lip process with suitable skimming attachment.

This machine has already been adapted to a wide variety of industries which have proved the efficiency of the design and manufacture, and it is rapidly becoming established as an extremely versatile addition to laboratory equipment and for manufacturers of high quality chemicals.

Science Centre Urged

THE report of the Government's Advisory Council on Scientific Policy, published last week, says the council is perturbed by the large number of firms that are insufficiently equipped with scientific staff and library facilities to apply the results of pure research. The report urges the Government to provide the science centre in London, already approved in principle, a national library of science and invention based on an expanded Patent Office library, and a national science lending library easily accessible to the North and Midlands.

The considerable amount that has been done since the war to increase the scale of scientific education is still not enough, it is said. The report is concerned with the lack of trained scientists and the continuing decline in numbers and quality of science teachers particularly in chemistry, physics and biology. It urges that more boys should stay at school until university age.

'The material fruits of Britain's past industrial greatness are no longer sufficient to carry us forward into the future' it says. 'Science constitutes one of the few instruments we have for attaining success and security.'

Precision Tubes

IN the precision tube field, report Accles and Pollock Ltd., great interest has been shown by chemical plant manufacturers in the developments in titanium, tantalum and zirconium. These three metals can now be supplied in a wide range of precision tubes, both round and section, and also manipulated, and are now definitely on a production basis. Chemical engineers have been particularly interested in titanium tube because of its outstanding resistance to sea water.

During the year, Accles and Pollock have also undertaken development work on precision tubes in niobium and cadmium, both of which have characteristics of value to chemical engineers in special applications.

Another recent development which has now passed from the experimental to the production stages is the output of tubes with extremely thin walls in relation to their external diameters. Tubes with walls as thin as .002 in. have been produced.

Effluent Treatment

SOLE British manufacturing and selling rights for the Gibbs air flotation plant (manufactured in the US by F. S. Gibbs Inc.) have just been acquired by L. A. Mitchell Ltd. This plant is designed for treating oily and fatty effluents for the removal of the oil and grease and for passing a pure effluent to waste. It may also be used for other effluents.

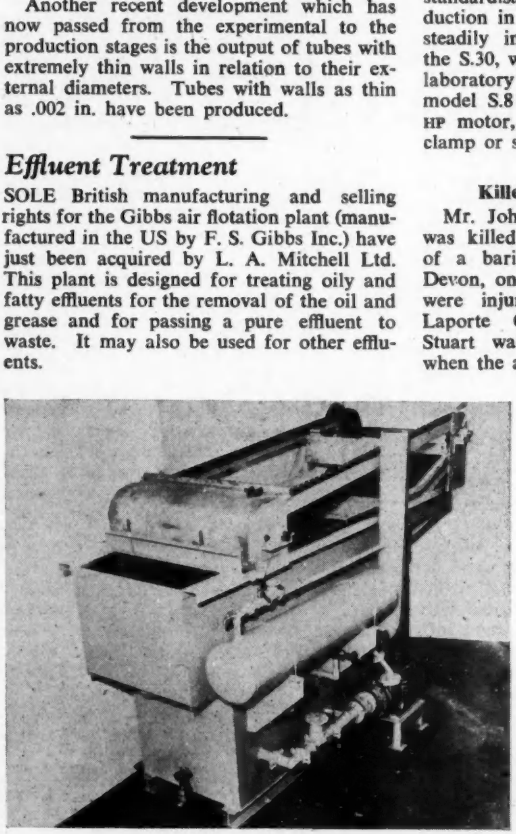
In the Gibbs' plant a continuous stream of small air bubbles is introduced in the flotation cell, causing the oily matter to rise to the surface, where it is removed by means of a sludge conveyor. The plant operates either with or without the addition of clarifying chemicals. Mitchells have recently installed a pilot unit in the works of a large company in the Midlands, for experimental work in the clarification of trade effluent.

Popular Stirrers

ON show at the International Industrial & Technical Exhibition at Charleroi (18 September to 3 October) are stirrers made by Voss Instruments Ltd. Due to extensive standardisation of parts and consequent reduction in cost, sales of these stirrers have steadily increased. The most popular is the S.30, with a 1/30 HP motor suitable for laboratory work, but for pilot scale work model S.8 can be obtained. This has a ¼ HP motor, and can be fitted with a robust clamp or stand.

Killed in Barium Sulphate Mine

Mr. John Stuart, manager of the mine, was killed by rock falling from the roof of a barium sulphate mine at Bridford, Devon, on 15 September. Two other men were injured. The mine is owned by Laporte Chemicals Ltd., Luton. Mr. Stuart was making a routine inspection when the accident took place.



Small pilot unit recently manufactured by Mitchell's, and installed in the factory of a Midlands firm for experimental work on effluent treatment

Valuable Semi-Metal

DSIR Report on Selenium

'SELENIUM,' a survey published on 14 September by HMSO, reviews the sources, production and uses of this semi-metal which has become increasingly important to the electrical industry in recent years.

The ability of selenium to rectify alternating current is used in radio communications, broadcasting, domestic radio and television receivers, electrolytic processes and radar equipment, and these uses are the predominating ones. Another electrical use is in a variety of photo-electrical cells. It is also used as a decoloriser in glass making and as a plastics colouring agent.

The expansion of the electronics industry during and since the war has resulted in a shortage of selenium. Any increase in supplies would be welcomed by industry because potential demand for selenium exceeds available resources.

There is no known deposit of selenium as such which is worth mining. The element occurs with sulphide ores and most of it is obtained as a by-product of copper refining. In the electrolytic refining of copper the 'anode slime' contains a fairly high proportion of selenium. The US is the biggest producer of selenium, all of it from this process, but its supplies are still not enough for its own industry and it has to import more of it. Most of Great Britain's supplies of selenium come from Canada, again from copper refining plant.

There is a possible source of selenium in this country which is now being investigated by the Chemical Research Laboratory as a result of a survey of the selenium problem by the Intelligence Division of the Department (see THE CHEMICAL AGE, 1953, **69**, 755 and 804). Flash roasting of pyrites is fairly new, but its use is expanding and it may produce quantities of selenium which would be worth recovering. The selenium is concentrated in the wastes, dusts and muds from the roasting plant. Little is yet known of the economics of recovery, but waste materials from three plants have been examined at the CRL. The materials from one plant contain sufficient selenium to justify the hope that recovery would be worth while. As in copper refining the problem is to develop a method which will not interfere with the primary object of the process and be cheap enough and simple enough to make selenium production pay.

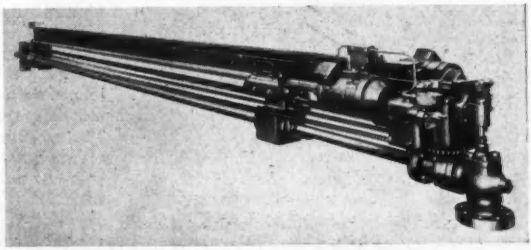
As far as can be seen at present the potential yield from this source will run into tons, a valuable addition to present supplies. One of the speculative things about recovery is that pyrites varies so much in its content of selenium. The CRL investigation shows, however, that the possibilities of augmenting the country's supplies of this extremely valuable element in this way are well worth serious consideration.

'Selenium' is published by HMSO for DSIR price 1s. 6d., by post 1s. 7½d.

Soot Blowing

AN important addition to the range of Hopkinsons Ltd. soot blowers is the long retracting type, introduced recently, for use in high-temperature zones in boilers where the width of the boiler and distance of the tubes from the blower nozzle preclude the use of the ordinary retractable type of blower, and where a multi-nozzle blower cannot be installed owing to high temperature and the difficulty of supporting the element.

The nozzle travels up to 20 feet entirely unsupported, and when not operating it is retracted into the wall box to prevent damage from burning. This soot blower is electrically operated, and arranged for automatic sequence control.



Hopkinsons' long retracting soot blower

Cleaning Gases

Year's Work by Peabody

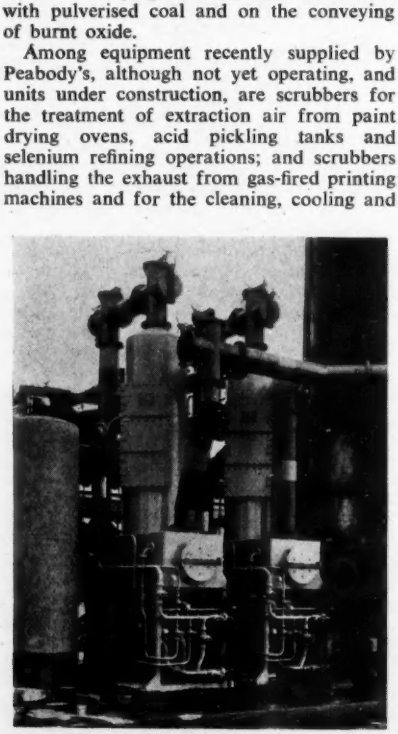
THE Peabody scrubber, which has been well known in the US for many years, is now becoming firmly established in this country and on the Continent and during the past year many new plants have been commissioned by Peabody Ltd. Further scrubbers for the cleaning and cooling of SO_2 gas in pyrites flash roasting sulphuric acid plants have been put into service supplementing those already operating.

The protection of vacuum pumps and the prevention of nuisance in pneumatic conveying systems is a field where the high dust removal efficiency of the Peabody impingement plate is seen to particular advantage. Recent commissionings include installations on the conveying of ash from boilers fired with pulverised coal and on the conveying of burnt oxide.

Among equipment recently supplied by Peabody's, although not yet operating, and units under construction, are scrubbers for the treatment of extraction air from paint drying ovens, acid pickling tanks and selenium refining operations; and scrubbers handling the exhaust from gas-fired printing machines and for the cleaning, cooling and purification of carbon monoxide used for organic synthesis.

Progress is also being made in the application of Peabody impingement plates to gas/liquid contact operations; in addition to the SO_2 effluent strippers included in the sulphuric acid plant units, SO_2 and H_2S absorbers have gone into service as well as a unit for the treatment of boiler flue gas prior to CO_2 production. Equipment in hand includes an organic liquid stripping column.

A full programme of site testing has been carried out with pilot plant equipment to assess the possibilities of the impingement plate on new applications.



Two Peabody scrubbers handling lime kiln gas

Aero Cock Down to Earth

LEAKPROOF, straight-through Saunders spherical plug aero cocks have now been adapted to industrial uses, and the 'M' cock is the latest addition to the range manufactured by Saunders Valve Co. Ltd. The operating plug rotates through 90° between two flexible rubber seats which tighten their seal as the fluid pressure increases. A flexible diaphragm unites the fixed body and movable spindle and prevents any leakage. The working parts of the cock are carried by the body, and by changing the detachable ends the cock can be adapted to a variety of uses. It is claimed to be particularly suitable for viscous fluids such as gum arabic, colloids, and varnishes.

Saunders 'M' cock, with flange and bib end

Construction & Corrosion

Bakelite Rigid PVC Solves Old & New Problems

SINCE the introduction some time ago by Bakelite Limited of Vybak industrial rigid PVC sheet VR.215 it has become evident from the interest which has been aroused in it that there is a very definite need in industry for a tough, chemical-resistant material of this nature. At the same time detailed knowledge of its capabilities is not as yet widespread, and a few examples of recent applications may therefore be of some practical value.

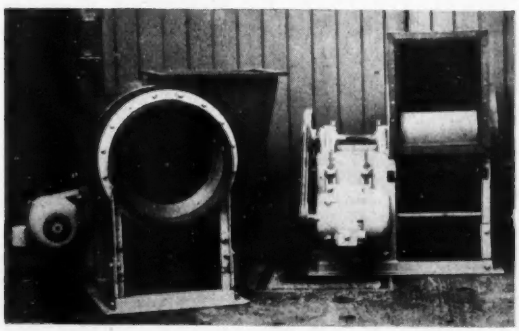
Originally, owing to wartime exigencies in this country, PVC was mainly produced in plasticised forms for cable-sheathing, and was for some time regarded merely as a substitute for rubber. From the beginning, however, the resin manufacturers realised that its outstanding chemical resistance might prove extremely useful in rigid forms. Plasticisers, moreover, tend to reduce this characteristic, though they assist processing, and the problem has been, therefore, to produce a workable compound without their aid.

Vybak sheet VR.215 is one of the answers and, whilst its strength is necessarily less than that of the special alloys and 'protected' metals for which it is in many cases an alternative, and, being thermoplastic, it cannot be used unsupported at temperatures above 60°, it is sufficiently robust to fulfil the many services requiring a non-corrosive, easily fabricated material within these limits.

In addition to its excellent resistance to chemical attack, especially from inorganic chemicals, VR.125 has good dimensional stability, low thermal conductivity and excellent ageing and electrical properties. It can be sawn, drilled, routed, milled, etc., and 'hot gas' welded with matching rod. It may also be formed by heating above its softening point and then cooling in contact with the desired contour.

Amongst early instances of the successful application of this sheet, the Turbro J.1 fan made by Turner & Brown Ltd., of Bolton, aroused considerable interest when it was introduced some time ago (see THE CHEMICAL AGE, 1953, **69**, 1286). This fan, with a capacity of 300-350 cu. ft. per min., has its case, impeller and impeller shaft entirely fabricated from VR.215 and is intended for use in conjunction with ducting of similar material. Since then, the same firm has developed a whole range of these fans, all from Vybak material, their latest being the Turbro J.5, which has a capacity of 4,000-4,500 cu. ft. per man against 1 in. water gauge and is powered by a totally-enclosed 2 BHP 3-phase, 50-cycle electric motor. Designed for general ventilation systems where corrosive fumes are present, and for the removal of corrosive fumes and vapour from chemical process vessels against low/medium resistances where quiet running is required, equipment of this size gives some indication of the potentialities of the plastics from which it is made.

Another good example of the use of Vybak rigid sheet is to be found in the print-



A slow speed multivane fan, for use against low/medium resistance where quiet running is required. It has a capacity of 2,000-2,500 cu. ft. per min. against 1 in. water gauge, and is mounted on a mild steel pedestal. It is made by Turner & Brown Ltd.

ing works of the St. Clement's Press, London, where it has been used to line an electroplating tank normally containing a solution of sulphuric acid and copper sulphate. As an alternative method of using the material another London printing works, the Britannic Litho Co. Ltd., have installed new processing tanks for the development and preparation of lithographic negatives.

Whilst Vybak sheet VR.215 will evidently find its main outlet in chemical plant of this nature where full advantage can be taken of its fine anti-corrosive qualities, its combination of light weight, easy handling and hard-wearing characteristics may well make it desirable in a wider field. With its companion compounds VN.904 for extruded piping and VN.905 for rod, it makes a valuable addition to the range of construction materials which are available to the builder and engineer.

Feeding Kek Mills

DURING the past year Kek Ltd. have perfected a new method of feeding Kek mills, employing the suction of the mill. For free-flowing materials such as granulated sugar all that is necessary is a hopper into which the sugar is emptied, and by regulating the damper the sugar is directed into the suction box and thence into the mill.

For materials which do not flow easily, such as certain colours and chemicals, then a shaker feeder is placed on the floor and the material is vibrated into the suction pipe. Finally, for lumpy materials such as colours direct from the vats, a kibbler is used as a pre-breaker and feeder.

Column Goes by Road

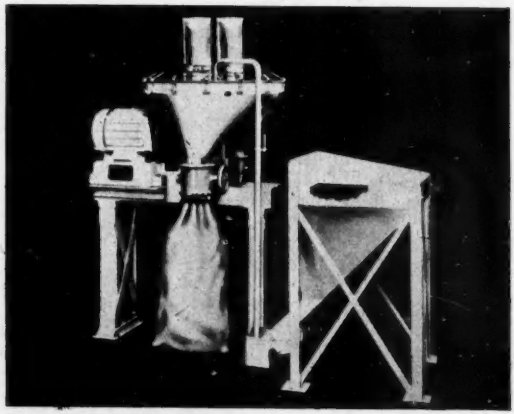
METAL Propellers Ltd., of Croydon, Surrey, are this week despatching by road a 55 ft. long, 2 ft. 6 in. diameter Monel distillation column for the Shell Refining and Marketing Co. Ltd., Stanlow, Cheshire. The column contains 40 of the new Shell patented Turbogrid distillation trays which Metal Propellers Ltd. are now manufacturing under licence.

The column is the longest complete plant ever despatched in one piece by the firm. Both column and trays are manufactured from Monel, a heat and corrosion-resistant metal manufactured by Henry Wiggin & Co. Ltd.

Less US Synthetic Rubber

THE US Government will produce 467,000 long tons of general purpose synthetic rubber in 1954, according to the Federal Facilities Corporation. Sales will be 489,000 long tons. These figures are the lowest since 1950, when the Government's plants produced 350,000 tons and sold 388,400 tons.

In 1953 production was 668,386 tons and sales 611,748. For the rest of this year, sales are estimated at 46,000 tons in October, 43,000 tons in November and 46,500 tons in December. Production for these months is estimated at 41,200, 40,500 and 41,500 tons.



New hopper attachment to a Kek mill

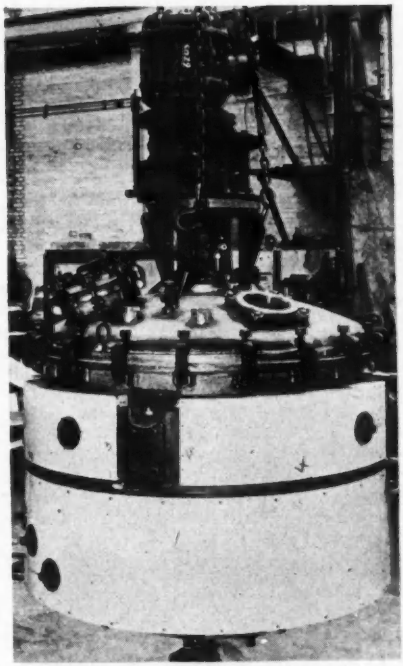
Electric Surface Heating

A CONSIDERABLE number of Isomantles for use with plant vessels have been manufactured during the course of last year. The illustration shows an Isomantle suitable for use in flameproof areas fitted to a vessel manufactured by The APV Co. Ltd. The Isomantle consists of a base heater section having eight separate circuits with independent flameproof terminal boxes and four side heat units, each with an independent circuit. These have coarse control through flameproof 3 heat switches and over-riding automatic control through a mercury-in-steel contact thermometer operating through intrinsically safe relays. The main control panel is situated outside the flameproof area. The installation is suitable for temperatures above 300°.

Smaller units are operating with enamelled metal vessels (supplied by Cannon Ltd.) and a large number of stainless steel vessels of various capacities and sizes.

Also manufactured were high temperature Isopanels 6 ft. long and 2 ft. 9 in. wide to operate at temperatures of 400 to 425°. These were installed on a 24 ft. high tower which was entirely heated by Isopanels. This is typical of a large number of Isopanel installations.

Isotapes have also been used in increasing amount during the last year, particularly for long fuel lines, and units are now available up to 70 ft. in length. A recent development is the type ITW waterproof Isotape which contains a silicone rubber sleeved heating element allowing its use outdoors at temperatures up to 220°.



Isomantle Type FPM/S150 G, with 12 circuits of 1,700 watts each, heating a vessel of 680 litres capacity to 275°

Industry Must Reorganise

UNLESS the South African chemical industry organises itself immediately to absorb the by-products from the Sasol oil-from-coal plant, there is a danger of the state making a further excursion into the field of private enterprise, according to Mr. J. Berman, chairman of the Transvaal Chemical Manufacturers' Association. The Sasol operation has been costed on the basis of selling all its wide range of by-products. If these are not sold, the state will have to create organisations similar to Klipfontein Organic Products to buy, process and sell Sasol by-products. Recent remarks by responsible officials suggest that the Government does not want to increase the number of state-operated industrial plants. But if private enterprise does not fill the gap, it may have to.

'Because of the vast sums of money invested in Sasol that enterprise must be made to pay,' Mr. Berman said.

Much depends on the Sasol pricing and marketing policy. If Sasol followed the traditional line of other semi-state bodies, such as the marketing and control boards, and fixed domestic prices higher than export prices, the chemical industry's potential development would be hindered.

Using many of the Sasol products would involve new techniques and the South African chemical industry will have to try to interest overseas organisations with the capital and the technical knowledge.

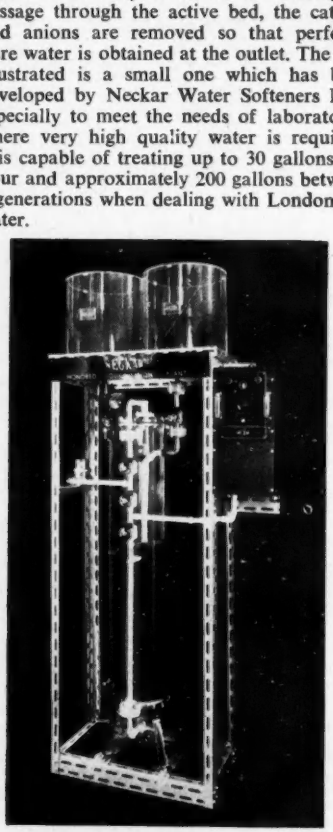
Purer Water

Neckar Market Monobed Exchanger

NOT many years ago, the production of pure water from tap water could only be achieved by distillation. Nowadays, however, by ion-exchange, it is possible to produce water purer than distilled water without the use of heat.

In the photograph shown here, the application of the process is by the mixed bed or Monobed system, in which the whole treatment is carried out in one cylinder.

Tap water passes through an intimate mixture of two synthetic resins. During its passage through the active bed, the cations and anions are removed so that perfectly pure water is obtained at the outlet. The unit illustrated is a small one which has been developed by Neckar Water Softeners Ltd., especially to meet the needs of laboratories where very high quality water is required; it is capable of treating up to 30 gallons per hour and approximately 200 gallons between regenerations when dealing with London tap water.



Neckar mixed resin water deionisation plant

The quality of the water is far superior to that obtained by an ordinary laboratory still. From the mixed bed process it is possible to obtain water having a conductivity of 0.2 Dionic units, whereas the average reading for normal distilled water is usually about 5 Dionic units. The cost of producing pure water by this process, again based on London water, is approximately 20 gallons for one penny.

The resins are practically indestructible and, when exhausted, are regenerated with hydrochloric acid in one case and caustic soda in the other. The unit is so designed that this can be done without removing the resins from the cylinder.

The unit shown here measures 7 inches diameter by 4 ft. high and is constructed in Perspex, with ebonite piping and valves.

New Plant at Shell Haven

NOW under construction at Shell Haven oil refinery, Essex, and expected to be completed by mid-1955 at a cost of £300,000, is a new plant which will produce and handle 10,000 tons a year of butane and propane.

There is a growing demand for butane as a fuel for domestic cooking and heating and commercially for similar purposes, for example, in the operation of canteens; propane is used in industry for metal-cutting, brazing, paint scaling and other similar operations. In the UK consumption of these products has increased by several hundred per cent since the war, and it is estimated that, apart from industrial concerns, well over 1,250,000 people are dependent on them for cooking, heating or lighting.

To keep the gases liquid at normal temperatures it is necessary to store them under pressure. At Shell Haven the new storage facilities will consist of large spherical tanks for butane and high-pressure, long, cylindrical vessels, called 'bullets,' for propane.

A bottling plant is also planned. This will contain equipment for pressure-testing the bottles (which are made of steel) and machines for putting the appropriate quantity of liquefied gas into each bottle. For the time being only propane is to be bottled, but bulk loading facilities are also to be installed for filling road tankers and rail cars with both propane and butane.

Stoneware Pipeline

Another Useful Doulton Improvement

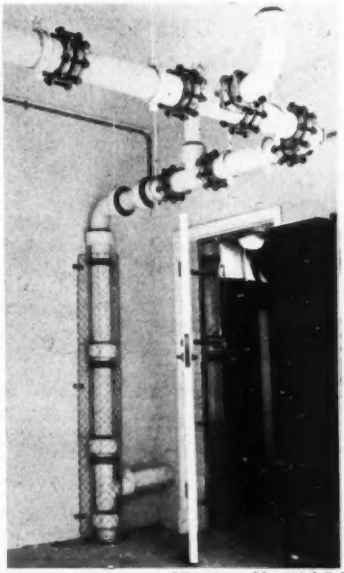
OLDEST method of joining stoneware pipes is by means of a socket on one end into which the spigot of the next pipe is inserted. Packing and special cement complete the joint. This is not, however, suitable for pipelines working under positive pressure. Another well-tried method is the use of a conical flange with a ground face at each end of the pipe, the faces being held together by metal couplings and bolts. The disadvantage is that each pipe must be made to the exact length required.

In order to overcome both these disadvantages, an improved method of coupling has been introduced by the Royal Doulton Potteries. This method employs butt-ended pipes with ground end faces coupled together by means of bolts passing through malleable iron flanges permanently secured to the stoneware.

There is thus no change of section in the stoneware which might lead to weakness; pipes can be cut from random lengths and ground exactly after firing, and the form of construction of the iron flanges causes them to grip the whole circumference of the pipe evenly through the special jointing compound used to hold the flange to the pipe.

A further point is that the outer circumference of the pipe is grooved at the end to grip the jointing composition, and, owing to the sawtooth configuration of the inner surface of the metal flange, the greater the pull upon the bolts, the greater the grip upon the pipe.

It is usual to insert a washer between the faces, and satisfactory joints can be made with rubber, PVC, asbestos, etc. Standard 45° and 90° bends, and bends at any other angle, can be made, as can T and Y junctions, crosses, reducers, expanders, blanking caps, etc.



[*Courtesy of Imperial College*

Butt-ended pipes joined in the new way, and, in the background, standard spigot and socket joints

Pipes are manufactured in two different ceramic bodies: the white is iron-free, and has a smooth transparent glaze inside and out; the grey is a dense, heavy, iron-free material with a high proportion of sintered alumina, and is suitable for use at higher temperatures than the white, up to 150°. Both are available up to 8 in. bore.

Wholesale Price Index

AVERAGE wholesale prices for most chemicals and chemical products remained the same in August as they had been in July. Most of them were higher than in August, 1953, but there were decreases in one or two commodities, the most marked being in synthetic resins and plastic materials.

Taking the prices of 30 June, 1949, as 100, dyes and dyestuffs were 129 (128.8 in August, 1953), disinfectants were 112.1 (108.8), insecticides, weed killers and fungicides 123.2 (123.5), synthetic resins and plastic materials (provisional figures) 121.1 (123.4), general chemicals 148 (143.2), pure benzole, BSS. 135:1950, 177.1 (177.1), caustic soda liquor, 100° TW, 146.3 (138), light soda ash (delivered) 152.9 (142.1), (f.o.r. works), 159.2 (148), sulphuric acid BOV 160.1 (146.3), ROV (94/95 per cent) 172.9 (168.4), drugs and pharmaceutical preparations 102.7 (102.6).

'Unthinking Prodigality' in Use of Coal

Smoke Abatement Society Conference

THE 21st annual conference of the National Smoke Abatement Society opened in Scarborough on 22 September. The three-day conference, with 500 members and delegates attending, was the largest air pollution meeting yet to be held.

'The Coal Crisis and the Society' was the theme of the opening address by the President, Sir Ernest Smith. We were, he said, at the beginning of a revolution in the way we obtained and used energy, for although nuclear energy was coming and we might obtain energy from other sources, we had no choice for the immediate future but to continue to rely mainly on our coal, even though it was bound to become scarcer, more difficult to mine and less satisfactory in quality.

'Our coal measures took millions of years to accumulate,' said Sir Ernest, 'and we have used them up with unthinking prodigality that will shock future generations. At last we are realising this and are at the beginning of another revolution—one that seeks to use coal as carefully and as sparingly as we can. We are like travellers in a desert with water bottles almost empty and a long way from the next oasis.'

Coal Savings

Sir Ernest—who is also chairman of the Industrial Coal Consumers' Council—paid tribute to advances that have been made in recent years in three of the major coal-consuming industries, as a result of which 47,000,000 tons of coal a year are being saved. In electricity generation the fuel saved in 1952 by the improvement of efficiency over 1925 amounted to over 27,000,000 tons. The gas industry also showed considerable advance, although being established for so long and being an industry using coal efficiently, its saving is less—3,200,000 tons compared with what would have been used at 1925 efficiency. The coal used in the iron and steel industry in 1952 was 26,900,000 tons; with efficiency at the 1925 level consumption would have been 43,700,000 tons.

In the afternoon the conference was addressed by Sir Hugh Beaver, chairman of the Government Committee on Air Pollution, who said the committee had virtually completed its report, which would soon be in the hands of Ministers.

He said he could not anticipate the findings, but he referred to the interim report, published last winter and said: 'Nothing that we have heard or seen in the course of the past year's intensive study and investigation has shaken our conviction in the general statements we made in that report. We referred to the colossal annual cost to this country from the pollution of the air. We have given a lot of attention to that matter and we are satisfied that no figures that have been hazarded in this respect really overstate the case.

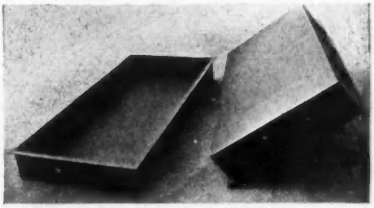
Profitable Investment

'We stated in the interim report that so far as smoke was concerned the cures were known; the only question was the best practical steps and the will to carry them out. That remains the position. The pollution of the air by smoke can be cured; of that there can be no question. We stated that it would cost money, but that any such expenditure would be a very profitable investment. We are all the more convinced that this is so.'

'The trouble is,' he continued, 'that every one of us plays two parts; we are the citizen with strong feelings as to public rights and the common weal and we are the individual with personal likes and idiosyncracies. We demand action to save life on the road, but invariably deny when stopped that we ever exceeded 30 miles an hour in a built-up area or crossed on the orange light. We subscribe to the Smoke Abatement Society and enjoy our open coal fire. I am not being facetious. I am pointing out that there is a great problem here to secure that there shall be such pressure of public opinion as will both demand and make possible action to cure air pollution and will accept the results of such action.'

In a reference to the National Industrial Fuel Efficiency Service, Sir Hugh said it was possible to produce particular cases where there might be some conflict between efficiency and smokelessness in the use of fuel. 'But such theoretical conflict should not be allowed to obscure the real fact that the efficient use, and the virtually smokeless use, of fuel go hand in hand,' he continued.

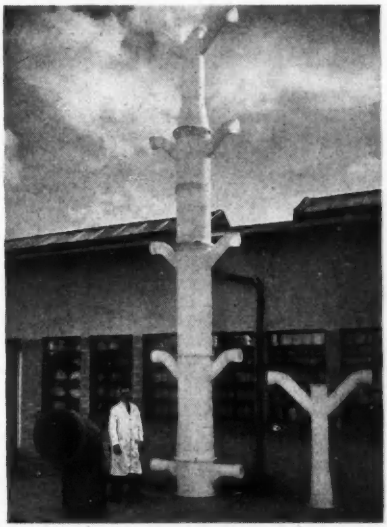
Pipeline sections of a fume duct in rigid PVC

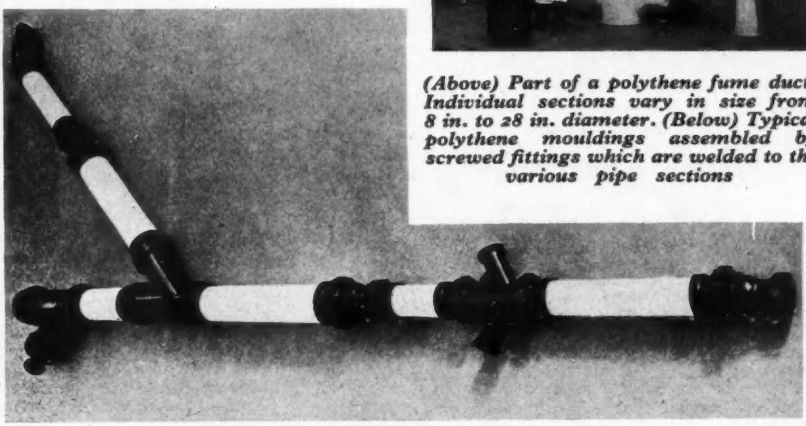


Drip trays in rigid PVC

Plant in Plastics

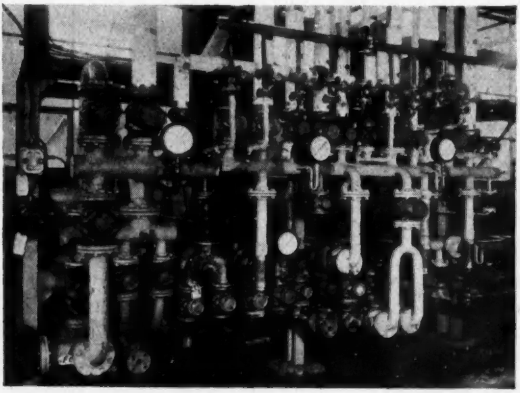
THE growing importance of polythene and rigid PVC as materials for the construction of chemical plant is well illustrated by these photographs of typical fabrications undertaken by Rediweld Ltd., Crompton Way, Crawley, Sussex





(Above) Part of a polythene fume duct. Individual sections vary in size from 8 in. to 28 in. diameter. (Below) Typical polythene mouldings assembled by screwed fittings which are welded to the various pipe sections

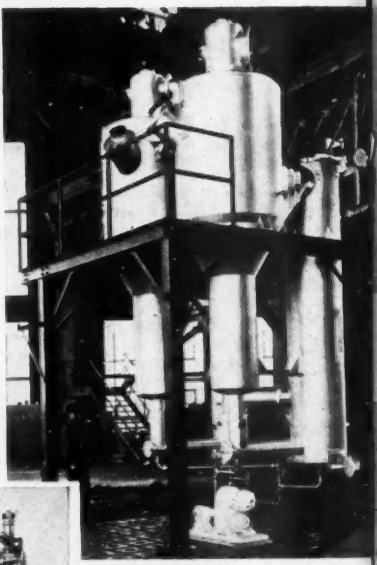
Plant



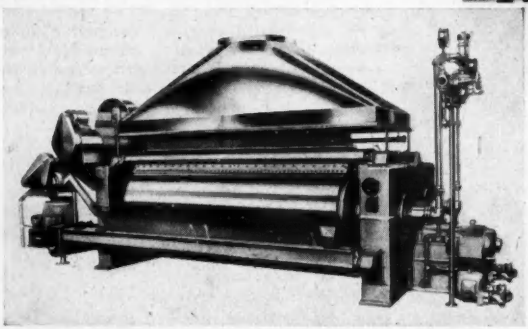
DURING the last year a number of new installations have been made in the factories of chemical companies and many new or improved items of plant have been announced. This picture review is an arbitrary selection of some of the interesting developments of recent months. More will be found on other pages

Courtesy of Lankro Chemicals Ltd.]

A VERY large number of Wynn diaphragm valves, made by Wynn (Valves) Ltd., were used in the construction of the raw materials distribution pump-house at Lankro Chemicals Ltd.



AS was recently announced in THE CHEMICAL AGE (1954, 71, 316,) Blaw-Knox Ltd. have concluded arrangements with the Blaw-Knox Co., Buffalo, N.Y., for the manufacture in Britain of 'Buflovak' equipment for evaporation, drying, solvent recovery and other processes. Our illustrations show (left) a 'Buflovak' double drum dryer equipped with stainless steel conveyors, elevator, flaker and pulveriser, and (above) a 'Buflovak' double-effect stainless steel evaporator. The plant will be available in Britain or for export against payment in sterling



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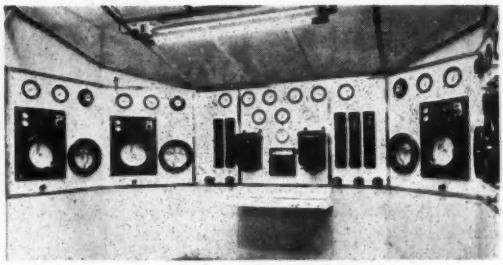
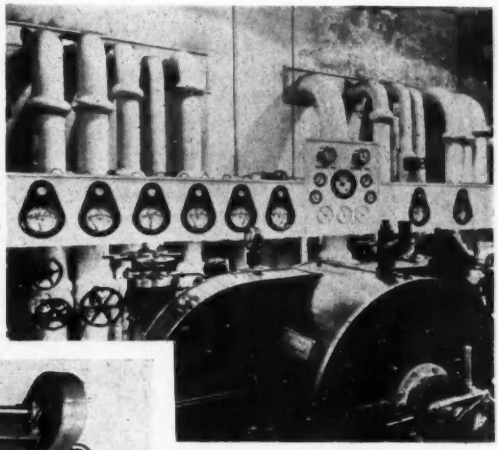
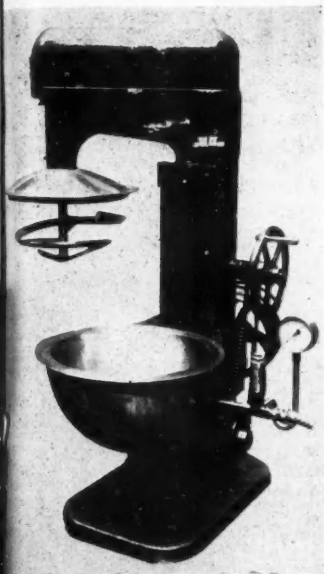


[Courtesy of Carless, Capel & Leonord Ltd.

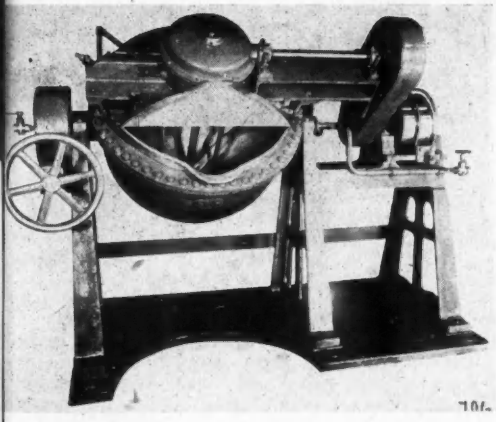
***KENT** meters and instruments in a control room of Carless, Capel & Leonard (above), and (below) Kent instruments in the turbine room of Lansil Ltd.*

[Courtesy of Lansil Ltd.





***BRIERLEY** incorporating machine, stainless steel, 18 in. diameter by 10 in. deep, works at 15 lb. steam pressure*



***MADE** by William Brierley, Collier & Hartley Ltd., this 3 ft. 3 in. by 2 ft. 7½ in. stainless steel pan has a cast-iron jacket for working at 15 lb. steam pressure. Brim capacity is 107 gallons. Worm and quadrant gear tilt the pan, and the stirrer is arranged to rotate as the pan is being tilted*

Chemical Engineer's Guide

To Companies Mentioned in this Issue

Accles & Pollock Ltd., Oldbury, Birmingham. Broadwell 1500.

The APV Co. Ltd., Wandsworth Park, London, S.W.18. VANdyke 4492.

Bakelite Ltd., 12-18 Grosvenor Gardens, London, S.W.1. SLOane 0898.

Birlec Ltd., Tyburn Road, Erdington, Birmingham 24. East 1471.

Blaw-Knox Ltd., 94 Brompton Road, S.W.3. KENsington 5151.

Thomas Broadbent & Sons Ltd., Central Ironworks, Huddersfield. Huddersfield 5520.

William Brierley, Collier & Hartley Ltd., Bridgefield Street, Rochdale. Rochdale 4181.

Davey, Paxman & Co. Ltd., Standard Ironworks, Colchester. Colchester 5151.

Doulton & Co. Ltd., Albert Embankment, London, S.E.1. RELiance 1241.

Electrothermal Engineering Ltd., 270 Neville Road, London, E.7. GRAngewood 0055.

Foxboro-Yoxall Ltd., Lombard Road, London, S.W.19. LIBerty 2461.

William Gardner & Sons (Gloucester) Ltd., Bristol Road, Gloucester. Gloucester 21261.

Hopkinsons Ltd., Huddersfield. Huddersfield 3469.

Isopad Ltd., 30-32 Rosemont Road, London, N.W.3. HAMpstead 8466.

Kek Ltd., Palmerston Street, Ancoats, Manchester 12. Ardwick 2122.

George Kent Ltd., Luton, Beds. Luton 2440.

Manesty Machines Ltd., Evans Road, Speke, Liverpool 19. Hunts Cross 1972.

Merrill Pumps Ltd., Cavendish Road, Sheffield 11. Sheffield 51440.

L. A. Mitchell Ltd., 37 Peter Street, Manchester 2. BLAckfriars 7224.

Neckar Water Softening Co. Ltd., Artillery House, Artillery Row, London, S.W.1. ABBey 6552.

Peabody Ltd., 300 Vauxhall Bridge Road, London, S.W.1. VICtoria 7431.

Horace Priest Chemical Engineering Co. Ltd., Farthings Hill, Horsham, Sussex. Broadbridge Heath 168.

Saunders Valve Co. Ltd., Cwmbran, Newport, Mon. Cwmbran 3281.

Simon-Carves Ltd., Cheadle Heath, Stockport. Gatley 3600.

Sturtevant Engineering Co. Ltd., Southern House, Cannon Street, London, E.C.4. MANsion House 0533.

Voss Instruments Ltd., Maldon, Essex. Maldon 517.

Wynn (Valves) Ltd., Wrexham: a subsidiary of **Charles Winn & Co. Ltd.**, Granville Street, Birmingham 1. Midland 7151.

Next Week's Events

TUESDAY 28 SEPTEMBER

The Fertiliser Society

London: Geological Society Lecture Hall, Burlington House, Piccadilly, 2.30 p.m. 'Usage of Fertilisers in South Africa' by Dr. D. B. D. Meredith (to be read by J. F. Twinch); 'Usage of Fertilisers in North Africa' by L. J. Carpentier.

Institute of Metal Finishing

London: British Institute of Management, 8 Hill Street, W.1, 6.30 p.m. Organic Finishing Group. 'Precision in Spray Paintings' by J. Muirhead.

THURSDAY 30 SEPTEMBER

Society of Chemical Industry

Aberdeen: Marischal College. Joint Conference of Food Group, Agriculture Group, Aberdeen Section and Scottish Institute of Biology. 'New Developments in the Utilisation as Food of Fish and Agricultural Products and their By-products' (to 2 October).

FRIDAY 1 OCTOBER

The Institute of Fuel

Cardiff: South Wales Institute of Engineers, Park Place, 6 p.m. South Wales Section meeting, 'Preparation of Water for use in Steam Boilers' by W. F. Gerard.

The Chemical Society

Manchester: The University, 6.30 p.m. Joint meeting with the Royal Institute of Chemistry and the Society of Chemical Industry. 'Some aspects of Research on Plant Growth-regulating Substances' by Professor R. L. Wain.

CHEMICAL ENGINEERING INSTRUMENTS & CONTROL METHODS. Edited by E. Molloy and E. Carr. London, George Newnes Ltd. 1954. Pp. 182. 25s.

Considering the increasing employment of automatic control in industry in general and the chemical industry in particular, the publication of a practical guide to the subject is welcomed. An admirable attempt has been made to collect into one volume information on a wide range of commonly used process control methods. The book is divided into 12 sections, each written by an authoritative person, and the bias is towards the practical applications of automatic control rather than the theoretical implications.

The uses of *p*H meters are dealt with in some detail and a number of laboratory methods for colorimetric determinations using tintometers and comparators are described. In this respect it is of interest to note that whereas 8 per cent of males are to some extent colour blind, only 0.4 per cent of females suffer from this defect.

A short section deals with moisture testing instruments based on the generation of acetylene from calcium carbide, the gas pressure being used as a measure of the water content. Both ultra-violet and infra-red spectrophotometry receive detailed attention. The applications of photo-electric instruments described include illumination measurements, surface gloss and covering power of paints and flame photometry.

Recent advances in polarimetry are illustrated with reference to the sugar industry. The sections on pressure control equipment, liquid level indicators and flow controllers will be of particular interest to chemical engineers, while the section on process control should be of interest to all who are concerned with process plant operation. The account of recent developments in the use of ultrasonic equipment in industry shows that the applications of this technique, although still in its infancy, are many and varied. The use of the manipulator box is described briefly for handling radio-active materials or chemicals in a controlled atmosphere.

In some sections the text reads like a manufacturer's catalogue, but this is, perhaps, unavoidable. However, a large number of typographical errors seem to have escaped the proof readers; this is particularly noticeable when chemical nomenclature is encountered. It is felt that rather too much space has been devoted to purely laboratory instruments and methods, especially in view of the title, but the book should prove to be an asset to technologists in the chemical industry. It is generously illustrated and an excellent index is provided.—J. W. MULLIN.

MICROBIOLOGY: An Introduction. By Ernest A. Gray. Crosby Lockwood & Son Ltd., London. 1954. Pp 176+xii. 10s. 6d.

A first glance at this book does not promote confidence in the authority of its contents: too many mistakes have passed the proof-reader, and the text is studded with those capital letters, which are intended to indicate the new and important terms, but which serve only to produce confusion in the mind of the eager reader.

The predominant faults of the book are indicated by the author himself in the preface. 'The plan of the book follows that adopted by the author during some years' teaching of microbiology to classes of laboratory assistants. . . . There was a general impression . . . . that microbiology is a modern subject that came in with the atom bomb while the older subject of bacteriology was established about the time Professor Fleming was a medical student.'

In a praiseworthy attempt to redress the balance, Mr. Gray has unhappily succeeded in avoiding all mention of present-day microbiology. At a time when fermentation has become a major source of both pharmaceutical and industrial chemicals, and when the research of both academic and applied microbiologists is concerned with the

fundamentally important subject of the metabolic cycle, Mr. Gray devotes the last 15 pages of his book to a chapter on 'Applied Microbiology,' in which six are concerned with an elementary study of food contamination and milk pasteurisation, 2½ with beer, two with wine, 2½ with silage, and just over one with flax retting. That is all.

The general structure of the book shows it to be little more than an expanded set of lecture notes and it is obviously designed to be supplemented by practical work. Without the supervision of a qualified person, however, it would be impossible to follow the working instructions, and the space taken up by these and by formulae for culture media would have been better devoted to a longer explanation of the principles of classification and identification of the various classes of micro-organism.—B.I.

FORSCHUNGSBERICHTE DES WIRTSCHAFTS- UND VERKEHRS-MINISTERIUMS NORDRHEIN-WESTFALEN. Nr. 59. Forschungs-Instit der Feuerfest-Industrie, Bonn. Westdeutscherverlag/Koln und Opladen. Pp. 51. DM. 11.60.

This publication by the Ministry of Industry and Commerce for Nord Rhein-Westfalen reports development in the analysis of refractory material. On pages 5-28 a quick photometric method for the determination of aluminium oxide, iron oxide and titanium dioxide in the refractory material by means of organic colour reagents is discussed, while on pages 29-51 the investigation of the alkali content of the material, using the flame photometer, is reported. For the determination of aluminium, iron and titanium, silica is removed by decomposition of the material with hydrofluoric and sulphuric acids, the residue fused with potassium bisulphate and the melt dissolved in decinormal sulphuric acid and made up to 250 ml. In portions of this solution the three components are determined by the spectrophotometer aluminium by means of the coloured lake developed with eriochromcyanin, iron from the colour developed with sulphosalicylic acid, and titanium from that developed with hydrogen peroxide.

The determination of the alkali content of ceramic material is difficult. The widely-used Lawrence-Smith method has considerable errors. For some years now development of the flame photometer in this connection has led to great simplification. In this report a review of methods using the flame photometer is outlined followed by a report on extensive investigations carried out using the Riehm-Lange flame photometer. Details are given of the adjustment of the instrument, the production of the standard solutions and the decomposition of the material for analysis.

This is a report well and critically written, worthy of purchase by industrial analysts and those whose interests are bound up with the analysis of refractories.—R. J. MAGEE.

SOLVENTS MANUAL: with Solubility Chart. By C. Marsden. Cleaver-Hume Press Ltd., London. 1954. Pp. 430 + xii. 70s. (Reinforced chart for laboratory wall, available separately, 12s.)

This is a book which it is a great pleasure to pick up. Mr. Marsden, who is employed by British Industrial Solvents, has naturally in the course of his professional work accumulated a mass of information on solvents from a great variety of sources, in which he found many discrepancies. As a result of careful and critical study of the conflicting data, this successful volume has appeared.

An appraisal of this book, which is far more exhaustive and far better organised than anything which has hitherto appeared, can be little more than a list of features. The physical characteristics and properties (including such as explosive limits, evaporation rates, and dilution ratios), source and manufacture, constitution of industrial grades, physiological properties, azeotropes, storage and handling, and manufacturers, are given for 221 different solvents. There are 17 appendices, including details of trade and proprietary names, and a list of 112 manufacturers in Great Britain and the US.

The wall chart gives the action of organic solvents on a wide variety of substances, and should prove of great value, although it is naturally a little difficult to read. It is a pity, however, that the dust-jacket of the book should claim 'the actions of some 250 organic solvents on about 150 solutes' when the actual figures are respectively 188 and 114.

This book should prove literally indispensable to a great number of chemists in a wide range of industries. The presentation is excellent, the format convenient, and the contents invaluable.—B.I.

HOME

Change of Address

The address of R. S. Colour Works Ltd. will be changed as from 27 September to 91 Belmont Hill, Lewisham, London, S.E.13. Tel.: Lee Green 5698.

Chemical Engineering Lectures

Two courses in chemical engineering, each of two lectures, are to be given in the Anatomy Lecture Theatre of University College, Gower Street, London, W.C.1. The first course, on 12 and 22 October, will be on 'Heterogeneous Reaction Processes' by Professor D. W. Van Krevelen, Director of Research, Dutch State Mines. On 18 and 19 November, Professor H. Kramers, Professor of Chemical Engineering at the Technological University of Delft, will give lectures on 'Heat and Mass Transfer from the Point of View of Unsteady Diffusion.' Admission to both series of lectures is free, and no ticket is needed.

Work on New Fuel

Work is being carried on at the National Coal Board's central research establishment on a new type of fuel, at present unnamed. According to Dr. J. Bronowski, director of the establishment, who described it to the NCB summer school at Oxford last week, it is 'a sort of coke, although it does not even look like coke.' He said it could be lit with paper and sticks. Experiments, added Dr. Bronowski, were now out of the laboratory stage, and the fuel was being produced by a pilot plant.

Research Laboratory Moving

On 1 October the Water Pollution Research Laboratory will move from its temporary premises in Watford, Birmingham and elsewhere to a new permanent building in Elder Way, Stevenage, Herts (Tel.; Stevenage 820). Although most of the staff are moving in during October it is likely to be some time before all the equipment has been installed and work is proceeding smoothly. It is not likely that an official opening will be made before the spring. The new premises include a three-storey block, containing administrative offices, an information section and microbiological, chemical and physical laboratories. There are also four pilot-scale laboratories.

Manchester Office Opened

Grey and Marten Ltd., City Lead Works, Southwark Bridge, London, S.E.1, announce the opening of their Manchester office at 4 Station Buildings, Altrincham, Cheshire (Tel.: Altrincham 5018). Mr. R. D. H. Hasted will operate from there.

Distillers Dividend

The directors of The Distillers Co. Ltd. announce that they have declared a dividend on the preference capital of the company for the six months ending 30 September, 1954, at the rate of 3 per cent, less income tax, payable on 15 November, 1954, to stockholders on the register at 17 September, 1954.

Define Powers of DSIR says Report

The Committee of Public Accounts, whose report was published last week, recommends, among other things, that a bill should be prepared at once to define the powers and duties of the Department of Scientific and Industrial Research which, it says, performs continuing functions that involve substantial expenditure. 'As the Ministry of Works explained, the research scientist develops his ideas as the work proceeds,' says the report. The Treasury has now put a £2,000,000 limit on the money to be spent in the foreseeable future.

New Division for Acheson Colloids

The demand for Gredag greases and compounds has made it necessary for Acheson Colloids Ltd. to establish a division to handle the growing volume of business. This will operate from the company headquarters at 18 Pall Mall, London, S.W.1. The Gredag range includes molybdenum disulphide greases and also compounds without graphite where complete resistance is sought to acids, alkalis and high pressure. The new division marks another step in the expansion of Acheson Colloids Ltd., who already export their 'dag' products to more than 50 countries. Another division was established, with its own factory, in 1953 to manufacture dispersions of finely divided pigments in all media, as part of a co-ordinated plan of Acheson Industries Inc. of New York, of which Acheson Colloids Ltd. is a unit.

• OVERSEAS •

Malayan Tin-ore Imports

Imports of tin-ore to Malaya during August amounted to 1,313 tons; 1,259 tons came from Siam, 48 tons from Burma and 6 tons from French Indo-China.

Record Italian Mercury Exports

Italian exports of mercury in the first seven months of this year were 1,582 tons. This is a new record and compares with 565 tons in the same period of 1953. Most of the mercury went to the USA.

Australian Uranium Treatment Plant Opens

Australia's first uranium treatment plant, at Rum Jungle, 60 miles from Darwin, began operating last week. It will produce uranium oxide concentrate. In addition to uranium ore produced at Rum Jungle, which is owned by the Australian Government, the plant will treat outside ores purchased by the Australian Atomic Energy Commission.

Venezuela Refinery Expansion

The capacity of the Royal Dutch-Shell refinery at Punta Cardon, Venezuela, is to be expanded by the building of a catalytic cracker with a capacity of 5,000 tons a day. An installation for producing high octane aircraft petrol will be built there. The refinery in Curaçao will also be provided with a catalytic cracking installation

More Sugar Refineries for Turkey

It is anticipated that Turkey will have 15 sugar refineries, producing 400,000 tons of sugar annually, by 1956. The refinery at Adapazari was added to the four already in existence in 1953, and the Konya, Amasya and Kutahya refineries will begin to operate as from the 1954 production campaign. In 1955 refineries will be opened at Susurluk, Burdur and Kayseri, and in 1956 at Erzurum, Malatya, Elazig, and Erzincan.

Canadian Sulphur Plant

Noranda Mines' new plant at Welland, Ontario, for producing elemental sulphur, sulphur dioxide and high-grade iron sinter is to begin operations next month. The rated capacity is about 350 tons of iron pyrites concentrates daily. The expected output is 54,000 tons of sulphur annually, of which about one-third will be in the form of elemental sulphur and the rest in sulphur dioxide gas.

French Steel Production Down

French iron and steel output during August fell because of holidays. Production of pig-iron was 686,000 tons compared with 751,000 in July, and steel dropped to 785,000 from 908,000 tons.

£2,500,000 Fertiliser Plant

The chemical concern, Norsk Hydro, is building at Glomfjord, North Norway, a £2,500,000 plant to produce 100,000 tons of complete fertiliser and 35,000 tons of nitrate a year. The plant, to employ 100 men, will be ready next year.

French Imports of Refractory Bricks

The French *Journal Officiel* of 4 September announced that during 1954 up to 60,000 tons of refractory bricks and building wares may enter France at reduced rates of duty. A reduced *ad valorem* rate of duty of 15 per cent for bricks imported under quota and a minimum *ad valorem* duty of 20 per cent for bricks imported outside quota will be imposed. The concession is reserved for goods for which a certificate endorsed by La Direction des Mines et de la Siderugie du Ministre de l'Industrie et du Commerce has been obtained. In Algeria certificates will be issued by La Direction du Commerce de l'Industrie et de l'Energie du Gouvernement General de l'Algerie within the limits of a quota fixed by the Ministre de l'Industrie et du Commerce.

Australian Gas Holder

The North Shore Gas Company, North Sydney, Australia, have entrusted The Power-Gas Corporation (Australasia) Pty. Ltd. with an order for the supply, delivery and erection at Willoughby of a 1,000,000 cu. ft. capacity three lift spiral guided gas holder complete with steel tank. The tank and all lifts will be of welded construction and radiographic inspection will be carried out on the welded seams of the tank sides. All materials will be of Australian manufacture and the lift sheeting would have a minimum thickness of 3/16 in., which is the normal practice in Australia at the present time. The Power-Gas Corporation (Australasia) Pty. Ltd., is a subsidiary of The Power-Gas Corporation Ltd., Stockton-on-Tees.

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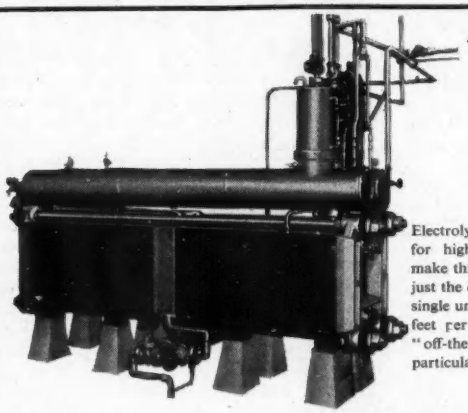

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PERSONAL

SIR ARCHIBALD FINLAYSON FORBES has been elected a member of the board of Shell Transport and Trading Company. He is chairman of the Debenture Corporation and the Iron and Steel Board and a director of Spillers. He was president of the Federation of British Industries for two years until April last year.

New managing director of Metal Porcelains, a subsidiary of Incandescent Heat, is MR. H. LAITHWAITE. He has been with the Radiation group, where he was in charge of vitreous enamel manufacture, since 1935.

The Ministry of Fuel and Power has announced that the Minister has reconstituted and strengthened the Fuel Efficiency Advisory Committee by the appointment of three additional members: DR. G. E. FOXWELL, MR. B. E. A. VIGERS and DR. W. A. MACFARLANE.

Four additional directors of Bradford Dyers' Association have been appointed. They are MR. REGINALD DAWSON, MR. CLIFFORD DUCKWORTH, MR. ROBERT RICHARDSON and MR. TOM FISHER. MR. ARTHUR WILSON has left the board.

MR. GEORGE M. FUERST and MR. E. F. WEATHERLEY have retired from the board of Lawfer Chemical Co. Ltd. This follows the sale by Fuerst Brothers & Co. Ltd. of its shareholding in Lawfer Chemicals.

The Council of the Institute of Metals has elected MR. HUBERT SANDERSON TASKER a Fellow, in recognition of his distinguished services to the Institute. The total number of Fellows is limited to twelve. Mr. Tasker joined the staff of Cookson & Co. Ltd., Newcastle-upon-Tyne, in 1910 and became a director of the company in 1920. In 1927 he was appointed managing director of Associated Lead Manufacturers Ltd. and subsequently managing director of Goodlass Wall and Lead Industries Ltd., on the formation of that company in 1931. He became vice-chairman in 1940 and was chairman from 1947 to 1951. He is also chairman of the British Titan Products Co. Ltd. Mr. Tasker was a vice-president of the British Non-Ferrous Metals Research Association from 1935 to 1951. He was elected a member of the Institute in 1933, and served as a member of council from 1938 to 1942, as a vice-president from 1942 to 1945 and again from 1948 to 1950, and as president from 1950 to 1951. He was chairman of the finance and general purposes committee from 1940 to 1944, and from 1945 to 1947 was honorary treasurer.

MR. C. M. SPIELMAN, O.B.E., M.C., M.Inst.C.E., M.I.Struct.E., managing director of Whessoe Ltd. since 1935, is relinquishing that position from the end of September and is succeeded by MR. A. G. GRANT, M.Sc., M.I.Chem.E., M.Inst.Gas E., director and general manager of the company. Mr. Spielman is retaining his seat on the board. Mr. Spielman, who joined Whessoe in 1923 as works manager, became a director the following year and general manager in 1925. He was educated at Clifton College and King's College, Cambridge, after which he was engineering pupil with Sir Douglas Fox and Partners. Mr. Spielman was a member of the Tank and Industrial Plant Association and of the Iron and Steel Consumers' Council during the nationalisation of the Iron and Steel Industry. He is on the Council of British Welding Research Association and of the recently appointed Admiralty Advisory Committee on Structural Steel. Mr. Grant joined the company as chemical engineer in 1930, was appointed general manager in 1938 and became a director in 1942. Educated at Leeds University where he was Corbet-Woodall scholar, he obtained a First Class Honours degree in Gas Engineering. He has been chairman of the British Chemical Plant Manufacturers' Association, member of the Grand Council, Federation of British Industries, and of the Council of British Engineers' Association. He has also served on the Councils of the Institution of Gas Engineers and the Institution of Chemical Engineers.

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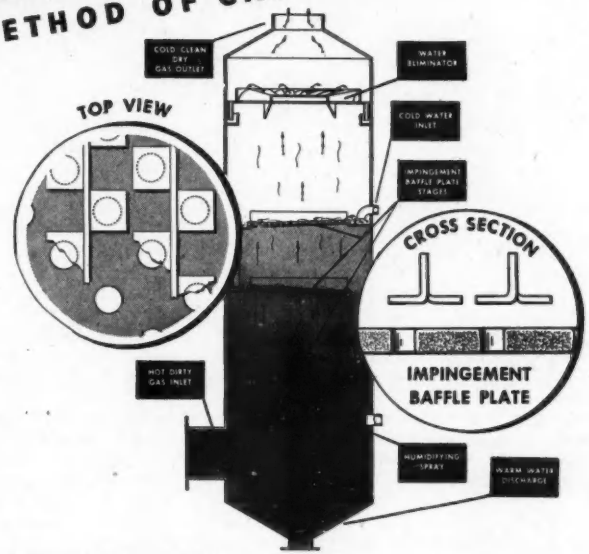

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Publications & Announcements

A GENERAL purpose material for the removal of rust from iron and steel and corrosion products from non-ferrous metals is described in a leaflet issued by its manufacturers, the Pyrene Co. Ltd., of Brentford. Known as Preperite No. 1, its advantages are claimed to be simplicity and economy in operation. The immersion solution is replenished as required and not discarded, and ferrous and non-ferrous materials can be treated with equal ease.

* * *

THE Aluminium Development Association's lists of information and educational services have become so long that they have had to be issued as two separate booklets, both of which have just been published. The list of publications gives details of the main series of technical books published by the association. These include information bulletins, applications brochures, research reports, reprinted papers and articles and books dealing with the association's membership, policy, organisation and services. There is also a note on *The Aluminium Courier*, an illustrated publication. The list of films, film strips and wall charts describes the association's service of visual aids, which also include specimen boxes, handicraft notes and photographs.

* * *

SHARPLES Centrifuges Ltd., of Tower House, Woodchester, Stroud, Gloucestershire, announce a new report which they have published describing the application of various types of centrifuges in the cocoa and chocolate manufacturing industry. This report, No. 2154, describes the various types of centrifuges available and the manner in which they are applicable to this industry.

* * *

GUIDANCE to firms wanting to sell goods to countries in the Soviet bloc is given in a booklet published by The Credit Insurance Association Ltd., who treat the subject 'purely as a business problem.' First, there is a warning that markets behind the Iron Curtain are unpredictable because they depend on the changing policies of their rulers. Then it is pointed out that nearly all foreign trade is carried out by large State trading corporations, whose only concern is to buy the goods needed for the country's current plan and sell the planned exports. On the other hand, payment is prompt, and no case of default is known. The booklet goes into detail about the mechanics of negotiating contracts and shipment. Penalty clauses for late delivery are often included, and other means of ensuring prompt delivery have been devised for non-capital goods. 'Some exporters may not find such conditions troublesome,' says the publication, 'but others, say chemical manufacturers, may find it a most awkward form of pressure. In practice, once friendly commercial relations have been established with the Eastern buyers, a cable explaining why delivery must be delayed will usually produce more flexible terms.'

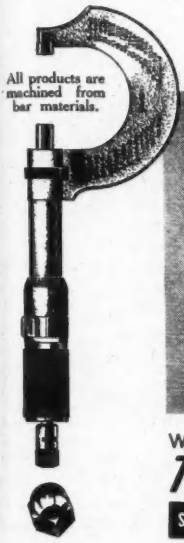
* * *

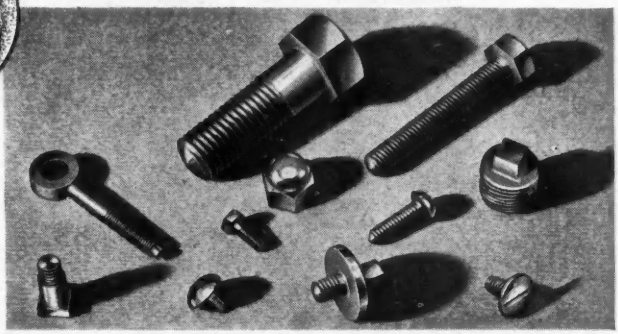
TO the uninitiated, and even at times to the initiated, the precise significance of the properties of petroleum products as determined by standard and other methods of test is not always apparent. In an attempt to clarify this subject, the Institute of Petroleum published in 1949-50 in the pages of the *IP Review* a series of thirteen articles, each dealing with an individual property or a group of inter-related properties. The reception which these articles received indicated that the subject was one which could with advantage receive wider publicity. Consequently, the various articles have been brought up-to-date by their authors, each of whom is an expert in his own field, and the whole series is now available in one volume: 'Significance of Properties of Petroleum Products,' edited by George Sell. Published by The Institute of Petroleum, 26 Portland Place, London, W.1, 7s. 6d. net.

* * *

ROAD Research Technical Paper No. 31 describes research carried out by the Road Research Laboratory in co-operation with the British Road Tar Association into the behaviour of tar macadam surfacings and into ways of improving the properties of the tars used for surfacing. The publication outlines the problem and describes studies of the effect of weathering, evaporation, chemical action and other factors on the behaviour of tar macadam surfaces. One of the properties discovered to be desirable in tar binders is resistance to atmospheric oxidation. A laboratory oxidation test for this property has been developed.

There is NO QUESTION about accuracy...





WITH STAINLESS STEEL BOLTS, NUTS & STUDS BY

THE SANDIACRE SCREW CO., LTD.

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Ciech

Central Import and Export Office for Chemicals

POLAND, WARSZAWA, JASNA 12

Telegrams : Ciech—Warszawa

Exporters of—

Organic and inorganic chemicals
Pressed carbon products
Pharmaceuticals
Reagents
Dyestuffs
Cosmetics

Sole representatives in Great Britain—

ANGLO-DAL LIMITED,
New Oxford House,
Bloomsbury Way,
LONDON, W.C.I.

British Chemical Prices

LONDON.—A sustained demand characterises most sections of the industrial chemicals market and deliveries to home consumers against contracts are fully up to schedule. Export trade also remains steady. Apart from the non-ferrous metal compounds there have been no important price changes, and quotations for the most part have a very firm under-tone. The coal tar products market continues on steady lines with perhaps rather more inquiry for pitch, and cresylic acid supplies appear to have a wider outlet.

MANCHESTER.—Satisfactory trading conditions have been reported during the week on the Manchester chemical market, with reasonably steady deliveries against contracts still being called for by the cotton textile bleaching, dyeing and finishing trades, and a good movement of supplies going to most other leading industrial outlets. A fair number of fresh inquiries covering a fairly wide range of products are being dealt with. Values generally remain on a steady to firm basis. Two successive advances of £1 each have brought the current quotations for sulphate of copper to £79 per ton. A steady demand for both the light and heavy tar products has been maintained.

General Chemicals

Acetic Acid.—Per ton : 80% technical, 10 tons, £86. 80% pure, 10 tons, £92 ; commercial glacial 10 tons, £94 ; delivered buyers' premises in returnable barrels ; in glass carboys, £7 ; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £130 per ton.

Alum.—Ground, about £23 per ton, f.o.r. MANCHESTER : Ground, £25.

Aluminium Sulphate.—Ex works, £14 15s. per ton d/d. MANCHESTER : £14 10s. to £17 15s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums ; 1 ton lots £58 per ton.

Ammonium Chloride. — Grey galvanising, £31 5s. per ton, in casks, ex wharf. Fine white 98%, £25 to £27 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £33 per ton.

Ammonium Persulphate. — MANCHESTER : £6 5s. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £97 and £94 10s. per ton.

Antimony Sulphide.—Golden, d/d in 5-cwt. lots as to grade, etc., 2s. 2d. to 2s. 8d. per lb. Crimson, 3s. 4½d. to 4s. 5½d. per lb.

Arsenic.—Per ton, £45 5s. nominal, ex store.

Barium Carbonate.—Precip., d/d : 4-ton lots, £39 per ton ; 2-ton lots, £39 10s. per ton, bag packing.

Barium Chloride.—£42 15s. per ton in 2-ton lots.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £42 10s. per ton d/d ; 2-ton lots, £43 per ton d/d.

Bleaching Powder.—£27 per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140-lb. bags, carriage paid : Anhydrous, £58 10s.; in 1-cwt. bags ; commercial, granular, £38 10s. ; crystal, £41 ; powder, £42 ; extra fine powder, £43 ; BP, granular, £47 10s. ; crystal, £50 ; powder, £51 ; extra fine powder, £52.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid : Commercial, granular, £67 ; crystal, £75 ; powder, £72 10s. ; extra fine powder, £74 10s. ; BP, granular, £80 ; crystal, £84 10s. ; powder, £87 ; extra fine powder, £86 10s.

Calcium Chloride.—70/72% solid £12 10s. per ton.

Chlorine, Liquid.—£32 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chromic Acid.—2s. 0¾d. per lb., less 2½%, d/d UK, in 1-ton lots.

Chromium Sulphate, Basic.—Crystals, £65 6s. 8d. per ton d/d UK, in lots of 1 ton and over.

Citric Acid.—1-cwt. lots, 205s. cwt. ; 5-cwt. lots, 200s. cwt.

Cobalt Oxide.—Black, delivered, 13s. per lb.

Copper Carbonate.—MANCHESTER : 2s. 1d. per lb.

ENGLISH & FRENCH FLINT PEBBLES

IT IS A MATTER OF OPINION whether you should use English or French pebbles, but whichever is your choice we can supply you with hand-picked individually selected pebbles ranging from ¼" to 6" in size.

They can be sent to any part of the world.

For over a century we have been noted for prompt deliveries and consistent quality and we value new enquiries.

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WEST THURROCK, GRAYS, ESSEX.

ULTRASORB ACTIVATED CARBON AND SOLVENT RECOVERY PLANT

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BRITISH CARBO NORIT UNION LIMITED

176, BLACKFRIARS ROAD, LONDON, S.E.1.

TELEPHONE: WATERLOO 7744 CABLE: BRICARBUN SEDIST, LONDON.

Copper Sulphate.—£79 per ton f.o.b., less 2% in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £9 12s.

Formaldehyde.—£37 5s. per ton in casks, d/d.

Formic Acid.—85%, £86 10s. in 4-ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1.260 S.G., £14 7s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hydrochloric Acid.—Spot, about 12s. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—27.5% wt. £124 10s. per ton. 35% wt. £153 per ton d/d. Carboys extra and returnable.

Iodine.—Resublimed B.P., 15s. 4d. per lb. in 28 lb. lots.

Iodoform.—24s. 4d. per lb. in 28 lb. lots.

Lactic Acid.—Pale tech., 44 per cent by weight £122 per ton ; dark tech., 44 per cent by weight £73 per ton ex works 1-ton lots ; dark chemical quality 44 per cent by weight £109 per ton, ex works ; usual container terms.

Lead Acetate.—White : About £140 per ton.

Lead Nitrate.—About £120-£125, 1-ton lots.

Lead, Red.—Basis prices per ton. Genuine dry red lead, £129 10s.; orange lead, £141 10s. Ground in oil : red, £146 15s. ; orange, £158 15s.

Lead, White.—Basis prices : Dry English in 5-cwt. casks, £132 5s. per ton. Ground in oil : English, 1-cwt. lots, 170s. per cwt.

Lime Acetate.—Brown, ton lots, d/d, £40 per ton ; grey, 80-82%, ton lots, d/d, £45 per ton.

Litharge.—£131 10s. per ton, in 5-ton lots.

Magnesite.—Calcined, in bags, ex works, about £28 per ton.

Magnesium Carbonate.—Light, commercial, d/d, 2-ton lots, £84 10s. per ton, under 2 tons, £92 per ton.

Magnesium Chloride.—Solid (ex wharf), £14 10s. per ton.

Magnesium Oxide.—Light, commercial, d/d, under 1-ton lots, £245 per ton.

Magnesium Sulphate.—£15 to £16 per ton.

Mercuric Chloride.—Technical Powder, 26s. 3d. per lb. in 5-cwt. lots ; smaller quantities dearer.

Mercury Sulphide, Red.—29s. 3d. per lb., for 5-cwt. lots.

Nickel Sulphate.—D/d, buyers U.K. £154 per ton. Nominal.

Nitric Acid.—£35 to £40 per ton, ex-works.

Oxalic Acid.—Home manufacture, minimum 4-ton lots, in 5-cwt. casks, about £131 per ton, carriage paid.

Phosphoric Acid.—Technical (S.G. 1.700) ton lots, carriage paid, £92 per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 3½d. per lb.

Potash, Caustic.—Solid, £94 10s. per ton for 1-ton lots ; Liquid, £37 5s.

Potassium Carbonate. — Calcined, 96/98%, about £63 per ton for 1-ton lots, ex-store.

Potassium Chloride.—Industrial, 96%, 1-ton lots, about £22 per ton.

Potassium Dichromate.—Crystals and granular, 11¾d. per lb., in 1-ton lots, d/d UK.

Potassium Iodide.—B.P., 12s. 4d. per lb. in 28-lb. lots ; 12s. 7d. in cwt. lots.

Potassium Nitrate.—Small granular crystals, 81s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 9½d. per lb. for 1-cwt. lots ; for 3 cwt. and upwards, 1s. 8½d. per lb. ; technical, £8 7s. per cwt. ; for 5-cwt. lots.

Salammoniac.—Dog-tooth crystals, £70 per ton ; medium, £67 10s. per ton ; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid. — MANCHESTER : Technical 2s. 7d. per lb. d/d.

Soda Ash.—58% ex-depot or d/d, London station, about £15 5s. 6d. per ton, 1-ton lots.

Soda, Caustic.—Solid 76/77% ; spot, £26 to £28 per ton d/d. (4 ton lots).

Sodium Acetate.—Commercial crystals, £80 to £85 per ton d/d.

Sodium Bicarbonate.—Refined, spot, £13 10s. to £15 10s. per ton, in bags.

Sodium Bisulphite.—Powder, 60/62%, £40 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£74 to £78 per ton, according to quantity.

Sodium Cyanide.—100% basis, 9¾d. to 10¾d. per lb.

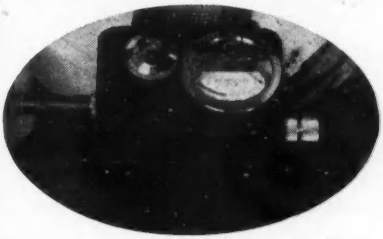
HELPING INDUSTRY PROTECT ITS WORKERS

COMBUSTIBLE GAS INDICATOR

This self-contained portable instrument quickly and accurately samples and tests combustible gases or vapour-in-air mixtures for explosibility. The indicator gives a direct reading in a few seconds, showing whether the atmosphere, under test, is below the lower explosive limit and indicates how nearly it approaches the explosive limit. It is light in weight; easy to use; economical to maintain.

The M·S·A EXPLOSIMETER

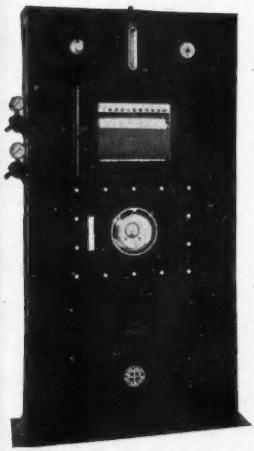
for use where there's danger from **HYDRO-CARBON GASES**



Is a simple, sturdy, compact, inexpensive and instantaneous combustible Gas Indicator, thoroughly efficient in operation and easy to use. Accumulation of Hydro-Carbon Gases is immediately detected.

Write for full particulars and descriptive literature.

The M·S·A COMBUSTIBLE GAS ANALYSER

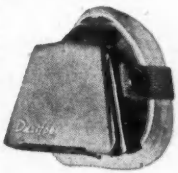


with Audible and Visual Alarm

Is an instrument designed to continuously analyse air for the presence of combustible gases or vapours up to the Lower Explosive Limit of the material in air. It is adaptable to analysing above the L.E.L. by providing a special flow system. Upon detecting the combustible constituents for which it has been calibrated it gives an accurate indication of the degree of concentration.

The M·S·A DUSTFOE RESPIRATOR

This respirator furnishes excellent protection against non-toxic dusts. It is clean, cool and comfortable to wear.
Light in weight and easy to handle the vision of the wearer is not affected.



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MINE SAFETY APPLIANCES COMPANY LTD.

QUEENSLIE INDUSTRIAL ESTATE, GLASGOW, E.3 *Telephone: Shettleston 3421. 'Grams: 'Minsaf' Glasgow*

Sodium Dichromate.—Crystals, cake and powder, 10d. lb. Net d/d UK, minimum 1-ton lots; anhydrous, 11½d. lb. Net del. d/d UK, minimum 1-ton lots.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals £34 a ton; commercial, 1-ton lots, £28 per ton carriage paid.

Sodium Iodide.—BP, 15s. 1d. per lb. in 28-lb. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £127 per ton.

Sodium Metasilicate.—£22 15s. per ton, d/d UK in ton lots.

Sodium Nitrate.—Chilean Industrial, over 98% 6-ton lots, d/d station, £27 10s.

Sodium Nitrite.—£32 per ton (4-ton lots).

Sodium Percarbonate.—12½% available oxygen, £8 2s. 10½d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £37 10s., anhydrous, £81; tri-sodium, crystalline, £39 10s., anhydrous, £79.

Sodium Prussiate.—1s. to 1s. 1d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber's Salt).—About £8 10s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot, £32 2s. 6d. per ton, d/d, in drums; broken, £33 2s. 6d. per ton, d/d, in drums.

Sodium Sulphite.—Anhydrous, £59 per ton; pea crystals, £37 12s. 6d. per ton d/d station in kegs; commercial, £23 7s. 6d. per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £23 11s. to £26, according to fineness.

Tartaric Acid.—Per cwt.: 10 cwt. or more, £11.

Titanium Oxide.—Standard grade comm., with rutile structure, £155 per ton; standard grade comm., £135 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d: white seal, £98 10s.; green seal, £97 10s.; red seal, £96.

Solvents and Plasticisers

Acetone.—Small lots: 5-gal. drums, £129 per ton; 10-gal. drums, £119 per ton. In 40/45-gal. drums less than 1 ton. £94 per ton; 1 to 9 tons, £91 per ton; 10 to 49 tons, £89 per ton; 50 tons and over, £88 per ton. All per ton d/d.

Butyl Acetate BSS.—£173 per ton, in 1-ton lots; £171 per ton, in 10-ton lots.

***n*-Butyl alcohol, BSS.**—10 tons, in drums, £161 10s. per ton d/d.

***sec.*-Butyl Alcohol.**—5 gal. drums £159; 40 gal. drums: less than 1 ton £124 per ton; 1 to 10 tons £123 per ton; 10 tons and over £122 per ton; 100 tons and over £120 per ton.

***tert.*-Butyl Alcohol.**—5 gal. drums £195 10s. per ton; 40/45 gal. drums: less than 1 ton £175 10s. per ton; 1 to 5 tons £174 10s. per ton; 5 to 10 tons, £173 10s.; 10 tons and over £172 10s.

Diacetone Alcohol.—Small lots: 5 gal. drums, £177 per ton; 10 gal. drums, £167 per ton. In 40/45 gal. drums; less than 1 ton, £142 per ton; 1 to 9 tons, £141 per ton; 10 to 50 tons, £140 per ton; 50 to 100 tons, £139 per ton; 100 tons and over, £138 per ton.

Dibutyl Phthalate.—In drums, 10 tons, 2s. per lb. d/d; 45 gal. drums, 2s. ¾d. per lb. d/d.

Diethyl Phthalate.—In drums, 10 tons, 1s. 10½d. per lb. d/d; 45 gal. drums, 1s. 11¾d. per lb. d/d.

Dimethyl Phthalate.—In drums, 10 tons, 1s. 7½d. per lb. d/d; 45 gal. drums, 1s. 8¾d. per lb. d/d.

Dioctyl Phthalate.—In drums, 10 tons, 2s. 8d. per lb. d/d; 45 gal. drums, 2s. 9½d. per lb. d/d.

Ether BSS.—In 1 ton lots, 1s. 11d. per lb; drums extra.

Ethyl Acetate.—10 tons lots, d/d, £135 per ton.

Ethyl Alcohol (PBS 66 o.p.).—Over 300,000 p. gal., 2s. 9d.; 2,500-10,000 p. gal., 2s. 11½d. per p. gal., d/d in tankers. D/d in 40/45-gal. drums, 1d. p.p.g. extra. Absolute alcohol (75.2 o.p.) 5d. p.p.g. extra.

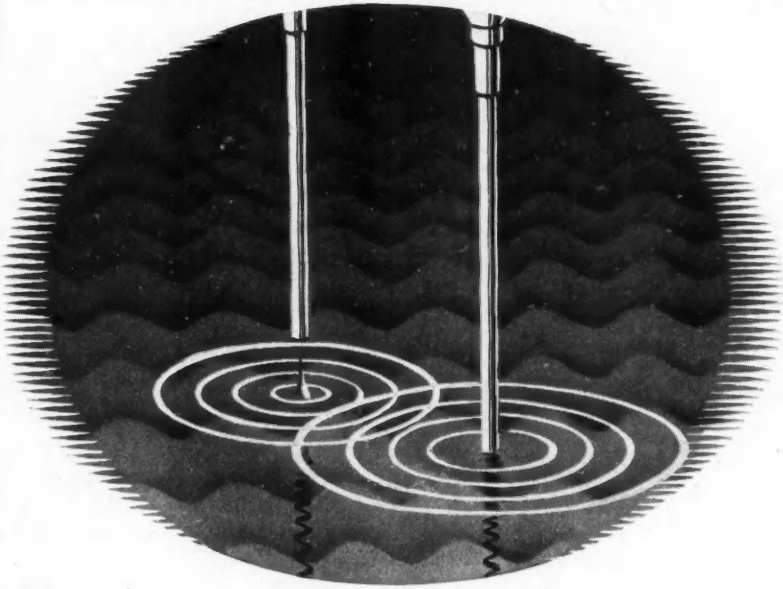
Methanol.—Pure synthetic, d/d, £43 15s. per ton.

Methylated Spirit.—Industrial 66° o.p.: 500 gal. and over in tankers, 4s. 10d. per gal. d/d; 100-499 gal. in drums, 5s. 2½d. per gal. d/d. Pyridinised 64 o.p.: 500 gal. and over in tankers, 5s. 0d. per gal. d/d; 100-499 gal. in drums, 5s. 4½d. per gal. d/d.

Methyl Ethyl Ketone.—10-ton lots, £141 per ton d/d

Methyl *iso*Butyl Ketone.—10 tons and over £162 per ton.

No overflow . . . No running dry



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AUTOMATIC LEVEL CONTROLS

Control units for around **£12.** *For non-conductive liquids use the Elcontrol Proximity Switch. Send for Data Sheets.*

The Elcontrol system provides an important all round " fail to safety " feature—it can be arranged to leave the controlled circuit either " open " or " closed " as desired, in the event of breakdown.

A variety of probe fittings for bore holes, open or pressurised vessels, sumps, etc., are available.

Suitable for town or distilled water, condensate, sewage, industrial effluent, and many other liquids and their foams.

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***iso*Propyl Acetate.**—In drums, 10 tons, £130 per ton d/d ; 45 gal. drums, £135 per ton d/d.

***iso*Propyl Alcohol.**—Small lots : 5 gal. drums, £118 per ton ; 10-gal. drums, £108 per ton ; in 40-45 gal. drums ; less than 1 ton, £83 per ton : 1 to 9 tons £81 per ton ; 10 to 50 tons, £80 10s. per ton 50 tons and over, £80 per ton.

Rubber Chemicals

Antimony Sulphide.—Golden, about 3s. per lb. Crimson, 3s. 4½d. to 4s. 5½d. per lb.

Carbon Bisulphide.—£61 to £67 per ton, according to quality.

Carbon Black.—8d. to 1s. per lb., according to packing.

Carbon Tetrachloride.—Ton lots, £76 10s. per ton.

India-rubber Substitutes.—White, 1s. 6½d. to 1s. 10½d. per lb. ; dark, 1s. 4½d. to 1s. 8d. per lb.

Lithopone.—30%, about £54 per ton.

Mineral Black.—£7 10s. to £10 per ton.

Sulphur Chloride.—British, £55 per ton.

Vegetable Lamp Black.—£64 8s. per ton in 2-ton lots.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton, in 6-ton lots, d/d farmer's nearest station, August, £17 12s. 6d.

Compound Fertilisers.—Per ton in 6 ton lots, d/d farmer's nearest station, I.C.I. Special No. 1 £27 9s.

'Nitro-Chalk.'—£15 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean agricultural for 6-ton lots, d/d nearest station, July to September, £25 15s. per ton.

Coal-Tar Products

Benzole.—Per gal., minimum of 200 gals. delivered in bulk, 90's, 5s. ; pure, 5s. 4d. as from 1 September.

Carbolic Acid.—Crystals, 1s. 4d. to 1s. 6½d. per lb. Crude, 60's, 8s. MANCHESTER : Crystals, 1s. 4½d. to 1s. 6½d. per lb., d/d crude, 8s. naked, at works.

Creosote.—Home trade, 1s. to 1s. 4d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 1s. to 1s. 8d. per gal.

Cresylic Acid.—Pale 99/99½%, 5s. 8d. per gal. ; 99.5/100%, 5s. 10d. American, duty free, for export, 5s. to 5s. 8d. naked at works.

Naphtha.—Solvent, 90/160°, 4s. 10d. per gal. for 1000-gal. lots ; heavy, 90/190°, 3s. 9½d. per gal. for 1000-gal. lots, d/d. Drums extra ; higher prices for smaller lots.

Naphthalene.—Crude, 4-ton lots, in sellers bags, £15 1s. 9d. to £22 per ton, according to m.p. ; hot pressed, £34 per ton in bulk ex-works ; purified crystals, £53 per ton d/d.

Pitch.—Medium, soft, home trade, 160s. per ton f.o.r. suppliers' works ; export trade 230s. per ton f.o.b. suppliers port.

Pyridine.—90/160°, 32s. 6d. per gal.

Toluol.—Pure, 5s. 7d. ; 90's, 4s. 10d. per gal., d/d. MANCHESTER : Pure, 5s. 8d. per gal. naked.

Xylol.—For 1000-gal. lots, 5s. 8d. to 5s. 10d. per gal., according to grade, d/d.

Intermediates and Dyes
(Prices Nominal)

***m*-Cresol 98/100%.**—3s. 9d. per lb. d/d.

***o*-Cresol 30/31° C.**—1s. 4d. per lb. d/d.

***p*-Cresol 34/35° C.**—3s. 9d. per lb. d/d.

Dichloraniline.—3s. 6d. per lb.

Dinitrobenzene.—88/89°C., 1s. 11d. per lb.

Dinitrotoluene.—S.P. 15° C., 1s. 11½d. per lb. ; S.P. 26° C., 1s. 3d. per lb. S.P. 33°C., 1s. 1½d. per lb. ; S.P. 66/68°C., 1s. 9d. per lb.

***p*-Nitraniline.**—4s. 5½d. per lb.

Nitrobenzene.—Spot, 9½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—2s. per lb.

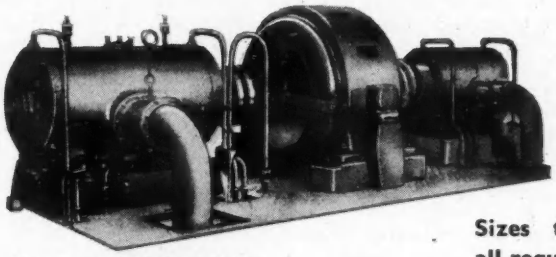
***o*-Toluidine.**—1s. 9d. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—5s. 6d. per lb., in casks.

Dimethylaniline.—3s. 1d. per lb., packed in drums, carriage paid.

HOLLAND-S.L.M.

ROTARY COMPRESSORS & VACUUM PUMPS



Capacities : 3–8000 cu. ft./min.

Sizes to meet all requirements

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MADE OF POLYTHENE • P.V.C. AND TERYLENE

FOR USE WHERE

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- BREAKAGE IS FREQUENT AND INSURANCE HIGH
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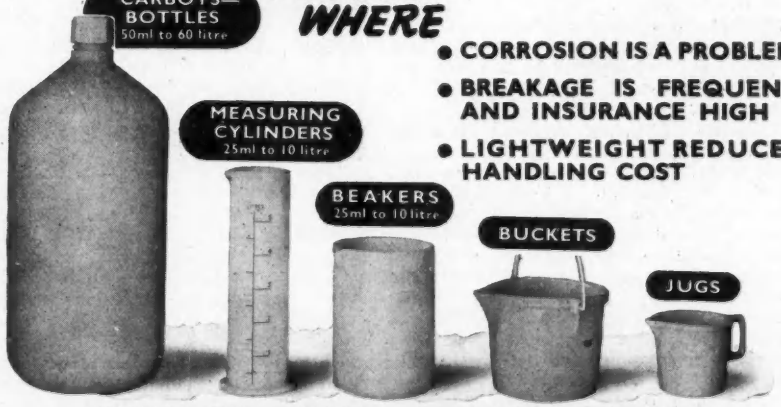

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Chemical & Allied Stocks & Shares

CHEMICAL shares have been prominent in stock markets in response to the half-yearly progress reports issued by well-known companies in the industry showing that the upward trend in earnings has been well maintained in the current year. The City has been pleased with the lead taken by chemical companies in issuing half-yearly progress reports because it believes this should become a general practice. More companies are planning to issue half-yearly profit figures—Shell have already announced their intention to do so—but chemical companies appear to be taking a lead in this, and it is apparent it is appreciated by shareholders.

Following General Trend

As was to be expected, chemical and kindred shares have moved fairly closely with the general trend of stock markets, and earlier gains were followed by a fair amount of profit-taking, though many shares record good gains on balance for the month. Compared with a month ago, Albright & Wilson 5s. shares have risen from 24s. 10½d. to 26s. 6d. in response to the higher interim dividend and the half-yearly progress report. Monsanto 5s. shares were also prominent owing to the good increase in the half-yearly profits and were 28s. 3d. compared with 25s. 1½d. a month ago. There has been considerable activity in Imperial Chemical in front of their interim dividend announcement. After rising to the new high level of 38s. 10½d. there was a small reaction to 38s. 3d., which, however, compares with 37s. a month ago.

Laporte 5s. shares were also a strong feature with a further rise to 17s. 4½d., Borax Consolidated remained under the influence of their interim dividend and rose on balance from 56s. 9d. to 59s. Reichhold Chemical 5s. shares with an advance from 11s. 10½d. to 13s. 7½d., were also good following their interim dividend announcement. Elsewhere, British Chrome Chemicals 5s. shares have strengthened to 31s. and Fisons were good in response to higher dividend expectations and at 58s. 6d. compared with 55s. 6d. a month ago.

Hickson & Welch 10s. shares held steady at 15s., and William Blythe 3s. shares remained an active feature around 18s. Boake Roberts 5s. shares changed hands around 12s. 6d. and in other directions, British Glues strengthened to 12s. Coalite & Chemical 2s. shares were dealt in around 3s. 3d. and Yorkshire Dyeware & Chemical 5s. shares have strengthened to 10s. 9d. The 4s. units of the Distillers Co. have been firm at 22s. 4½d. on further consideration of the chairman's annual review. United Molasses have not kept best levels at 34s. 9d., but buyers remained in evidence for Unilever which were active around 83s. 6d. on renewed talk in the market of prospects of a scrip issue of free shares.

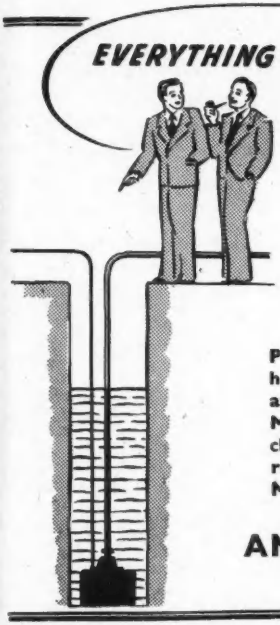
Among plastics shares, Bakelite 10s. shares held steady at 26s., and British Xylonite were prominent with an advance on the month from 39s. 6d. to 42s. In other directions, Boots Drug 5s. shares were 25s. 9d. xd. Glaxo 10s. shares at 56s. 9d. have been well maintained. General Refractories 10s. shares changed hands around 31s. 9d., Sangers 5s. shares were 15s. 1½d. Powell Duffryn reacted to 33s. 3d. after an earlier rise. Staveley were 47s. 9d. and Guest Keen 62s. 3d. Oils have not kept best levels, Shell easing to 98s. 1½d. Anglo-Iranian changed hands at slightly over £15½.

National Engines for I.C.I.

A LARGE order for diesel and dual-fuel engines has recently been placed with The National Gas and Oil Engine Co. Ltd. by the Kellogg International Corporation. This equipment will be supplied to Imperial Chemical Industries Ltd. for driving compressors at their No. 2 Olefine Plant, Wilton, Yorkshire.

The total power involved is approximately 11,000 BHP, to be obtained from thirteen engines; these comprise five normally aspirated diesels of the F4A series, three pressure-charged diesel engines of the B4AU type and five of the latest pressure-charged dual-fuel B2AUP5 units. All will be direct coupled to reciprocating gas compressors.

An interesting point about the dual-fuel units is that, while they will normally operate on ethane gas, they can be changed over to full diesel operation while running.



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Queen's Buildings, 10 Royal Avenue, Belfast. TELEPHONE: 26509
Palace Street, Plymouth. TELEPHONE: 2261

266/38

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

LEDA CHEMICALS LTD., London, W. 4 August, mortgage to City Prudential Building Society, securing £1,900 and any other monies, etc.; charged on 59 Middleton Avenue, Chingford. *£28,140. 22 December, 1953.

Satisfaction

DORAN INSTRUMENT CO. LTD., Stroud, scientific instrument manufacturers. Satisfaction 20 August, of debenture registered 22 February 1949.

Increases in Capital

The following increases in capital are announced: A. ELDER REED & CO. LTD., from £20,000 to £30,000; TENANTS (LANCASHIRE) LTD., from £35,000 to £100,000; RELIANCE MANUFACTURING CO. (BLACKLEY) LTD., from £25,000 to £50,000; CRYSTAL PRODUCTS CO. LTD., from £10,000 to £50,000; HALEWOOD CHEMICALS LTD., from £1,000 to £7,000; PURE CHEMICALS LTD., from £10,000 to £100,000.

New Registrations

Collings & Davis Ltd.

Private company. (537,905). Capital £100. Manufacturers of and dealers in partly or fully finished optical products, chemists' sundries, motor and garage accessories and materials, toys and games, office, factory and household furniture, catering equipment and foodstuffs, industrial oils and greases, cleaning, polishings, scouring and abrasive materials, soaps and detergents, etc. The permanent directors are: G. S. d'A. Collings, and R. J. P. Davis. Reg. office: 85 Walton Street, S.W.3.

Whitscroft Chemicals Ltd.

Private company. (537,812.) Capital £100. Manufacturers, processers, importers and exporters of and dealers in chemicals, disinfectants, solvents, etc. Directors: Clare C. Cole and Beryl M. Cole. Reg. Office: 13 Stratford Place, London, W.1.

Savoy (Cosmetics) Ltd.

Private company. (537,984). Capital £100. Manufacturers of and dealers in chemicals, cosmetics, etc. Directors: L. Carmell, A. E. Gruber, and Mrs. R. Griszgott. Reg. office: Balfour House, Finsbury Pavement, E.C.2.

Company News

Reichhold Chemicals

Reichhold Chemicals has declared an interim dividend of 7½ per cent equal to 4½d. per 5s. share. The directors' intention is to effect a more even spread between the interim and final dividend.

Powell Duffryn Ltd.

The annual general meeting of Powell Duffryn Ltd. has been postponed until later in the year because the detailed completion of the negotiations with Socony-Vacuum of New York has taken longer than was expected. However, the board have declared a second interim dividend of 5 per cent actual, less income tax, on the £9,660,471 ordinary stock for the year ended 31 March, making 8 per cent for the year. Consolidated trading profit and other income for the year was £1,810,362, compared with £1,476,910 for the previous year. Consolidated net profit was £777,395 (£556,883).

Farbwerke Hoechst AG

Total turnover of Farbwerke AG and its associated companies, one of the successor organisations of the former IG Farben, rose to DM. 942,600,000 in 1953. Exports were 29 per cent of the total. Profits were affected by falling prices and totalled DM. 20,075,701. A dividend of 7 per cent is recommended.

Famous Links

Staveley Chemicals are the "Links" between raw materials and finished products in industry.

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STAVELEY

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They have many features of interest such as removable agitators, self-emptying troughs, safety devices, etc. Six sizes available with trough capacities between 2 cu. ft. and 20 cu. ft.

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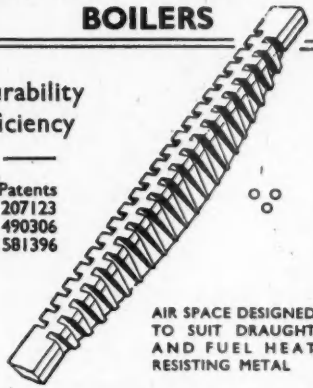

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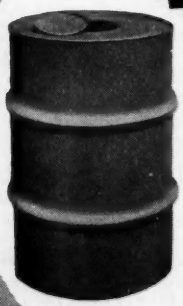

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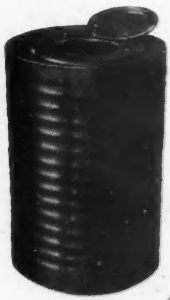

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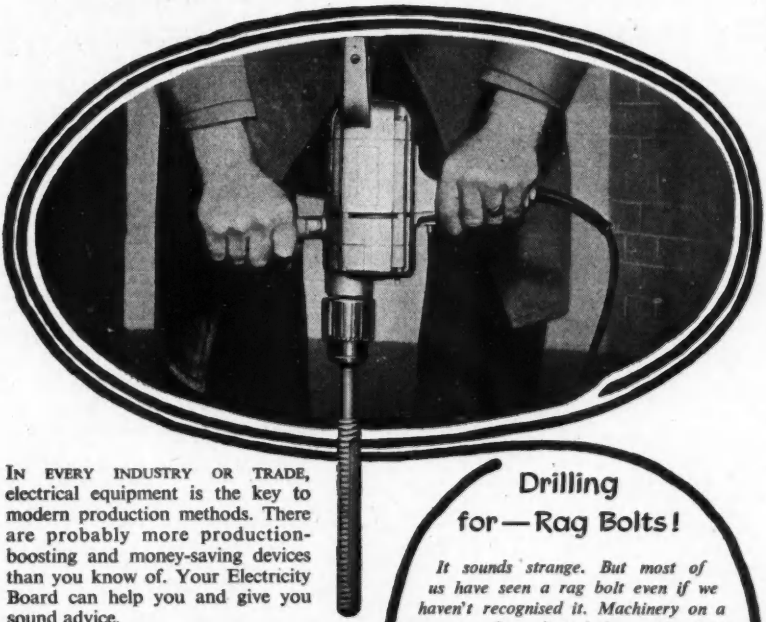

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CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive, or a woman aged 18-59 inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order, 1952.

A. BOAKE, ROBERTS & CO., LTD., require the services of **SHIFT CHEMISTS** for Plant Control work. Academic qualifications will be an advantage, but are less essential than industrial experience.
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Applications, plainly marked **SHIFT CHEMISTS,** to **PERSONNEL MANAGER, A. BOAKE, ROBERTS & CO., LTD., 100, CARPENTERS ROAD, E.15.**

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ONE TORRANCE MICRO TWIN-ROLLER MILL. Cast rolls, 14 in. by 8 in. Water cooled. Fast and loose pulley-drive.
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ONE BERTRAM TWIN ROLL FILM DRIER, with steam-heated rolls 60 by 28, complete with motor, starter, vapour hood, etc. In first-class condition.
One ½-ton **GARDNER RAPID MIXER,** with trough approx. 8 ft. long by 3 ft. by 3 ft.
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Several Johnson **CAST-IRON FILTER PRESSES,** various sizes and types.
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Two Gardner " H " size Steam-jacketed **MIXERS.**
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WORKING NOTICE

The Proprietor of British Patent No. 633,844 for "A PROCESS FOR OBTAINING INSECTICIDE SUBSTANCES IN A HIGH GRADE OF DISPERSION OR PULVERISATION, THROUGH THE INCORPORATION OF CARBON DIOXIDE," desires to enter into negotiations with a firm or firms for the sale of the patent, or for the grant of licences thereunder. Further particulars may be obtained from MARKS & CLERK, 57 & 58, LINCOLN'S INN FIELDS, LONDON W.C.2.

THE Proprietors of British Patent No. 654,484, for "MANUFACTURE OF BASIC ESTERS OF 4-AMINO- AND 4-ALKYLAMINO 3-ALKOXYBENZOIC ACIDS," desire to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder. Further particulars may be obtained from MARKS & CLERK, 57 & 58, LINCOLN'S INN FIELDS, LONDON, W.C.2.

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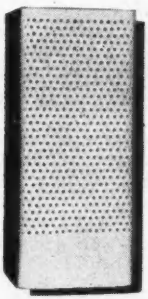

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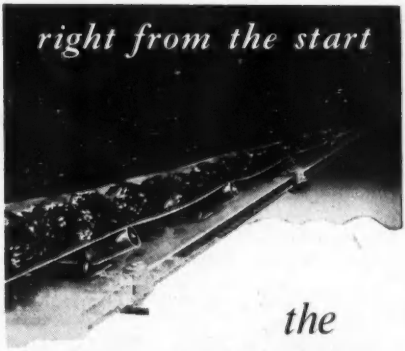

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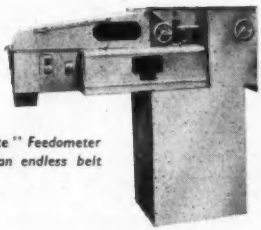

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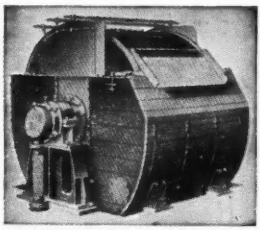

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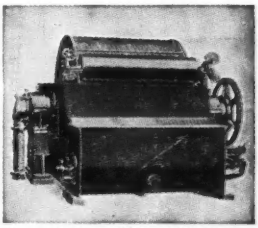

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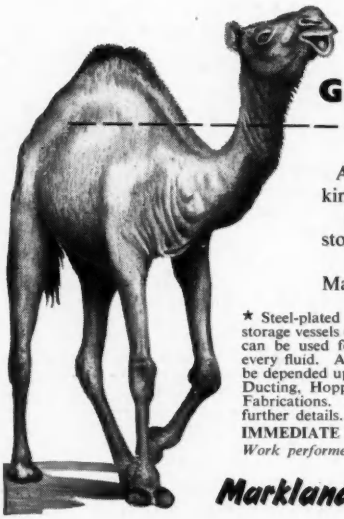

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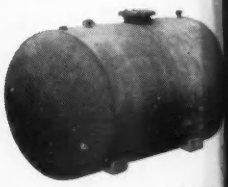

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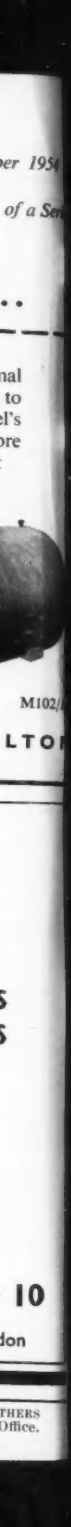
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